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RESEARCH IN TECHNICAL COLLEGES

It is sometimes overlooked that the main function of technical colleges is the advancement as well as the dissemination of knowledge, especially knowledge of value to industry and to those engaged in industry. Research work can make an important contribution in a college teaching advanced students, the vitality it brings to the instruction being frequently as important as the knowledge gained or the training given in methods of investigation. The post-1956 reorganization of technical education, particularly at technological level, and the emergence of Colleges of Advanced Technology have given an impetus to the expansion of research facilities in the technical colleges. This development and the recent announcement of new postgraduate qualifications—especially the Institute's Research Diploma and the M.C.T.—provide an appropriate background against which to review the position as it affects the teaching of chemistry.

Unfortunately the time has still not come when research is acknowledged by all Local Education Authorities as a normal and, indeed, an important function of the technical colleges. Hence there is no general pattern to the scope and practice of research in progress at the present time. In some colleges chemical research is a very important activity of the Science Department enthusiastically supported by staff and full-time research students. But in many colleges it is still a pipe-dream with many factors, such as lack of facilities and equipment, mitigating against the pursuit of research topics, whilst in a few colleges there is just insufficient interest in research.

It is believed that there is some chemical research in progress in at least 40 technical colleges. This represents only about half of the colleges recognized by the Institute for training candidates for the Graduate Membership examination. If the interpretation of research is extended to include all types of investigations, such as projects undertaken in liaison with industry or the investigation of teaching methods—not necessarily leading to original publications—the number of colleges engaged in some form of research may well be much higher.

In each of two large colleges—one a college of advanced technology and the other a regional college—there are more than 50 research workers in the Chemistry Department. This includes full-time and part-time members of the teaching staff as well as full-time and part-time research students. In a further 5 colleges there are between 25 and 50 research workers, but in the majority of colleges there are fewer than 10 research students. In some colleges there are just one or two members of staff engaged on research who are endeavouring to complete projects started elsewhere. However, the total number of chemistry research projects under way in technical colleges last session would appear to be well over 300.

The facilities available for research vary considerably from college to college. In some colleges the only space available is found in the corner or at one end of a teaching laboratory. In others, small rooms have been partitioned off from large laboratories. In at least one college, which has a rather old-fashioned type of chemistry laboratory with lofty ceilings, a mezzanine research room has been constructed at one end of the laboratory with access by means of a ladder. But in a few colleges the facilities have obviously been designed in an enlightened manner; in some a total area of as much as 3,500 sq. ft is available. For colleges that actually possess research laboratories an average seems to be about 1,000 sq. ft total area available specifically for research.

In many technical colleges, especially the smaller ones, research in chemistry is at present undertaken only by members of the teaching staff. This means that their research interests have to be integrated with their teaching duties. If the latter are particularly onerous, the time for research naturally becomes less and the research project may then take a long while to complete—and may indeed never be completed. To help members of staff who have genuine research projects in train, many Local Education Authorities are prepared to allow some time for research in lieu of teaching duties. This usually amounts to three or six hours per week, although for a Reader or Principal Lecturer it may be 12 hours per week. Not all Local Authorities appreciate the desirability of allowing teaching staff time for research. There is room for considerable improvement here, but it is only fair to expect that some initiative and enthusiasm should first be displayed by the members of staff concerned, and it is reasonable to expect them to disclose the nature of their project and the qualification, if any, to which it might lead.

Most full-time research workers, who will normally possess a good honours degree or an equivalent qualification, are eligible for a research studentship for the purpose of postgraduate training in chemistry. Since 1956 such awards from public funds have usually been made available through the Department of Scientific and Industrial Research (D.S.I.R.), although some Local Education Authorities and colleges still make arrangements to secure research workers through research studentships or assistantships. At present more than 2,000 D.S.I.R. research studentships in science and technology are held in universities and technical colleges and the number of new awards to be made this year is expected to be about 1,000. What is so

disappointing is the small number of students of research calibre who have chosen technical colleges for their training; in 1958 less than 2 per cent of the new research studentships made available by D.S.I.R. were for tenure in technical colleges, though it should be added that the great majority of these were in chemistry. This is not a position with which we can be content. Although most D.S.I.R. research studentships in chemistry are made to university graduates, D.S.I.R. will consider graduate and corporate members of the Royal Institute of Chemistry for its awards—in fact at present 10 such members of the Institute hold D.S.I.R. studentships and it is confidently expected that an increasing number of Graduate Members will do so in the future to work for the newly established Institute Research Diploma. The basic value of a D.S.I.R. Studentship is £270 to £420 per year, tax free, and this may be augmented by certain allowances for post-graduate industrial experience, dependants, teaching or demonstrating, and travelling. Full details of the awards made available by D.S.I.R. are to be found in the booklet *D.S.I.R. Studentships and Fellowships*, obtainable from H.M.S.O.

What higher degrees and other qualifications are available for the research worker in those technical colleges which are not recognized by a university for the award of internal degrees, and these are the great majority? For the research student with a first degree of the University of London there need be no problem. He can submit the broad outline of his field of work and the name of his supervisor to the University of London and register in advance for an external higher degree. Many members of teaching staffs in technical colleges are, in fact, completing work for London M.Sc. or Ph.D. degrees. But with the gradual decline in technical colleges of courses leading to the external B.Sc. (London) special degree in chemistry, there has arisen a problem for a student who wishes to remain at a technical college, part-time or full-time, for research work. The B.Sc. (special) courses in chemistry have been replaced, partly by an expansion of the Grad.R.I.C. courses, partly by the new Dip. Tech. in applied chemistry and partly by the London external B.Sc. degree awarded on a general honours course. Students who obtain high honours on this latter course may apply for registration for a higher degree of London and they are eligible for a D.S.I.R. award.

But a substantial number of students obtain the Graduate Membership of the R.I.C. by examination—last year there were 204 successful candidates in the Part II—and these are not eligible for a London external higher degree. Some succeed in obtaining research posts in universities, where they can satisfy the residential requirements by pursuing a research topic on a full-time basis for three years. There are also a few isolated examples of affiliation between a technical college and a university, students undertaking research work at the technical college under the guidance of a supervisor appointed by a neighbouring university. Such research work is then submitted as a thesis for a M.Sc. or Ph.D. degree of the university. But for those who wish to stay at a technical college, perhaps as part-time students, there is obviously a need for a different type of postgraduate qualification. This is one of the reasons why the Institute recently established its own Research Diploma, a qualification that is intended to be of Ph.D. standard. Although the Regulations for the new Diploma were announced only a few months ago (see *J.*, 1959, 707) more than 20 students have already been accepted by the Council for registration; many of these will be carrying out their research work in technical colleges. This is an encouraging beginning, and it is hoped that many more applicants will come forward for registration next session. Another new award is the Membership of the College of Technologists (M.C.T.). This award, which was introduced by the National Council for Technological Awards, will normally be made for a programme of work (not necessarily research) carried out jointly in industry and at a college. The College of Technologists will expect a high standard of those who wish to register as candidates for the M.C.T., but it will not be restricted to holders of the Diploma in Technology.

By no means all research in technical colleges, however, is undertaken for the purpose of obtaining a higher degree or equivalent qualification. In fact, there are probably more *ad hoc* short-term research projects in progress at any given time than research designed specifically for a higher degree or equivalent. The initiation of short-term special research problems often results from local industrial needs, and a valuable link is thus effected between industry and technical education. Industry can, and has, assisted many colleges in this direction by donating expensive items of equipment, and some colleges have thus been able to develop useful specialized research facilities, not merely for dealing with specific industrial problems.

Some indication of the amount of research in progress in technical colleges is obtained by reference to published papers. It is not easy to obtain a complete picture of the volume of published articles, but the Chemistry Department of one large technical college has published well over 150 papers and articles during the last decade. There are, however, many other colleges which submit a significant number of papers for publication each year. It would be helpful if the colleges themselves or perhaps the Regional Advisory Councils would issue lists of papers published each year. Some colleges and Advisory Councils already do this, but the practice is far from common.

A most important aspect of research, in the broadest sense, is the attention technical college lecturers give to investigations into methods of presenting their subject-matter. The rapid developments of the last few years

in the understanding of many phenomena through modern theories of atomic and sub-atomic structure, have spurred the more able teachers to reappraise their systems of teaching and to introduce substantial modifications, leading to more logical and co-ordinated presentation and to a more comprehensible and sound basis for further study. There are also numerous ways in which standard experimental techniques may be improved and new demonstration experiments devised to illustrate theoretical topics. If the Chemistry Department has the services of experienced technicians, such as glass blowers and instrument mechanics (preferably with some knowledge of electronic circuits) new apparatus can be designed and constructed for certain experiments. The scope for such work is considerable, especially in the field of small-scale equipment for organic and physical chemistry experiments.

In advanced chemistry and applied chemistry teaching and research are complementary. The pursuit of new knowledge stimulates the teacher, and the exposition of his ideas to his colleagues and senior students provides a healthy atmosphere for the virile growth of a Chemistry Department. Technical Colleges should make their full contribution to the development of research and they should be encouraged and assisted by the Local Education Authorities.

D. G. CHISMAN

THE DEVELOPMENT AND ORGANIZATION OF SCIENTIFIC RESEARCH IN INDIA

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During the second world war it became apparent that there was need for planned scientific organization in India, so that the war effort and industrial activities could be co-ordinated and the resources of the country utilized and developed more efficiently.

The Council of Scientific and Industrial Research was established in 1942. Councils for agricultural and medical research had been in existence for some time, and care was necessary to avoid overlapping of activities. Professor A. V. Hill from the United Kingdom was invited to visit India and submit a report on the needs of the country in the fields of scientific and technical development. His Report was published in 1945: the conclusions and recommendations formed the basis for much of the development which has since taken place.

In 1946 a Department of Scientific Research was created. The Ministry of Natural Resources and Scientific Research was constituted in 1951, and the Department of Atomic Energy was set up in 1954. In 1958 the Government of India declared their science policy as 'to foster, promote and sustain by all appropriate means the cultivation of science and scientific research.'

NATIONAL LABORATORIES

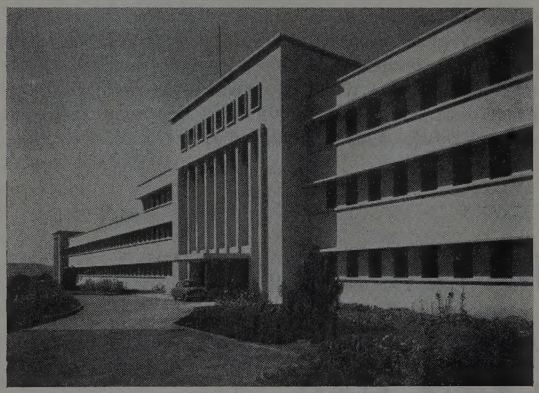
From its inception in 1942 the Council of Scientific and Industrial Research addressed itself to the task of developing scientific and industrial research on a national scale. Plans were formulated at an early stage for a National Physical Laboratory and a National Chemical Laboratory and also for laboratories to

Secretariat Buildings of the Council of Scientific and Industrial Research, New Delhi

serve various industries, such as metallurgy, ceramics, fuels, drugs and so on. The Council also launched a grant-in-aid scheme for sponsoring research on specific projects in the national laboratories, in the universities and in approved industrial laboratories. Today there are twenty national laboratories

functioning and four others are under construction or planned.

The National Physical Laboratory at New Delhi is equipped for the maintenance of, and research on, fundamental and derived standards. It also undertakes research into standards of industrial performance



National Chemical Laboratory, Poona

and practice. The National Chemical Laboratory undertakes investigations covering the chief applications of chemistry in industry.

The other laboratories are: The National Metallurgical Laboratory, Jamshedpur; the Central Fuel Research Institute, Jealgora (with Coal Survey Stations at Jealgora, Raniganj, Bilaspur, Ranchi, Jorhat and Nagpur) the Central Glass and Ceramics Research Institute, Calcutta; the Central Food Technological Research Institute, Mysore; the Central Drug Research Institute, Lucknow; the Central Leather Research Institute, Madras; the Central Building Research Institute, Roorkee; the Central Road Research Institute, New Delhi; the Central Salt Research Institute, Bhavnagar; the National Botanic Gardens, Lucknow; the Central Electronics Engineering Research Institute, Pilani; the Indian Institute of Biochemistry and Experimental Medicine, Calcutta; the Central Mining Research Station, Dhanbad; the Central Electrochemical Research Institute, Karaikudi; Regional Research Laboratory, Hyderabad; Regional Research Laboratory, Jammu; the Central Mechanical Engineering Research Institute, Durgapur; and the Central Public Health Engineering Research Institute, Nagpur. For research on aeronautics, on medicinal plants and on scientific instruments, separate laboratories are in hand. A further Regional Research Institute devoted to problems of interest to Assam is being set up. A new institution is also under consideration for petroleum research.

The work of the National Laboratories obviously covers a wide field. Some of these laboratories have undertaken surveys and assessments of raw materials for industry and carried out investigations on indigenous substitutes for raw materials hitherto imported. Special mention may be made of the national survey of India's coal resources which has provided enough basic information on the fuel resources of the country to enable the Government to plan the expansion of the iron and steel industry. At other laboratories, new or improved processes of manufacture have been developed. The activities of these laboratories embrace both fundamental and applied research, and also include active liaison with industry, dissemination of scientific information, and direct or indirect promotion of interest in science and technology. The Birla Industrial and Technological Museum of the Council at Calcutta is significant in this respect.

Sponsored Research

In addition to fostering research in its own laboratories and research units, the Council supports research in universities and research institutions through its 13 Research Committees which deal with numerous other sections of scientific and engineering research. These Committees are composed of representatives of universities, research institutions and industry: they function, in effect, as national committees in their respective fields. They are concerned not only with the progress of research schemes under their purview, but also with the wider question of enlarging the research effort of the country.

National Metallurgical Laboratory, Jamshedpur

Sponsored research has proved particularly fruitful in the training of research personnel. More recently a scheme for junior and senior Postgraduate Research Fellowships, tenable normally for two years in national laboratories, universities and other research institutions, has been instituted. There are also postgraduate training scholarships available in specified subjects in countries of the Commonwealth.

Other Activities and Research Units

The Council maintains a Patents Section and assists inventors in the drafting of specifications and filing of

patent applications. There is also an Industrial Liaison Section with regional offices at Calcutta, Bombay, Madras and Jaipur, and co-operative research associations operate in some industries. To help in matters of staffing, a National Register Unit maintains a roster in card-index form showing the availability, qualifications and experience of Indian scientists and technologists in the country and abroad.

Among the co-operative research associations for the investigation of problems connected with specific industries, mention may be made of the association conducted by the textile industry of Ahmedabad, the silk and art-silk mills of Bombay, and the jute mills of Calcutta. An association for the rubber industry is under consideration.

To help in disseminating the research results from the work of the laboratories, the Council publishes monthly

The Central Fuel Research Institute, Jealgora, Bihar

the *Journal of Scientific and Industrial Research*, which contains original papers and review articles. Processed research information and technical digests are also published in *Research and Industry*, a journal addressed particularly to industry. A major publication of the Council is the *Dictionary of Indian Raw Materials and Industrial Products*. This is an encyclopaedia published under the popular title, *The Wealth of India*.

India participates in international research projects, such as those connected with the collection of ionospheric data and the International Geophysical Year. The Radio Research Committee of the Council functions as the national committee in India for the International Union of Radio Sciences. INSDOC represents India on the International Federation of Documentation.

In the field of Nuclear Research the Atomic Energy Commission is responsible for formulating and implementing policy. The scientific and technical work of the Commission is carried out by the Atomic Minerals Division and the Atomic Energy Establishment, Trombay (near Bombay), which is India's centre for training, research and development work in this field. The Trombay Establishment consists of three main groups —physics, chemistry and engineering—in addition to the biology, medical and health divisions. Besides the laboratories of the various divisions for research and training, the facilities of the Establishment include 'Aspara,' India's first reactor. Under construction are 'Zerlina,' a zero energy reactor for lattice investigations, and the Canada-India-Reactor, a joint project under the Colombo Plan.

The Commission's industrial activities include Travancore Minerals (Private) Ltd, set up in October, 1956, jointly with the Governments of Kerala and Madras. Its main products are ilmenite and monazite. The Commission has also a pilot plant in operation at Ghatsila, Bihar, for the extraction of uranium from the tailings from the copper mines. Heavy water will be produced in quantity at Nangal in North India.

To further the development of nuclear science the Commission provides grants-in-aid to various universities, laboratories and research institutions. Considerable research work is being conducted at some 15 universities and research institutions. In this connexion, the Tata Institute of Fundamental Research, Bombay, has done pioneering work. The Institute was established in 1945, before the Commission was established, for the promotion of fundamental research in physics, mathematics and allied sciences, and has since been recognized by the Government of India as a national centre for advanced study and fundamental research in nuclear physics and mathematics. The Institute is the chief centre for cosmic ray and elementary particle physics, and has made outstanding contributions in this field. Other main centres of nuclear and cosmic-ray research include the Physical Research Laboratory, Ahmedabad; the Bose Institute, Calcutta; the Indian Institute of Science, Bangalore; and the Saha Institute of Nuclear Physics, Calcutta.

DEFENCE RESEARCH

An Indian Defence Science Organization was set up in August, 1948, to help in the integration of scientific and military techniques and to assist the Armed Forces in maintaining and improving their efficiency. It includes a Psychological Research Wing for work on the assessment of human personality. An Institute of Armament Studies was started at Kirkee in May, 1952, for the study of the performance of weapons and equipment, and to help in the training of Technical Staff Officers for the Services.

In addition, a Defence Science Service was created in April, 1953, to establish closer integration of the scientific work in the different defence establishments, and to make more effective use of available scientific personnel and resources. A chain of laboratories is being set up in the country under the Defence Science Organization. At Jodhpur, one such laboratory is

being equipped to carry out investigations on weapons and equipment under conditions of dry heat, the assessment of conditions in arid zones, desert physiology, and the effect of such environment on service personnel. Another laboratory is due to be set up at Mussoorie to undertake research on food and other problems relating to the health and efficiency of personnel operating in high altitudes and cold climates.

A Gas Turbine Research Centre, recently established at Kanpur in collaboration with the Council of Scientific and Industrial Research, will undertake studies on fuel efficiency and the performance of gas turbines under tropical conditions. The existing laboratories will be expanded and equipped for research in aeronautics, electronics, metallurgy and so on.

AGRICULTURE AND FISHERIES

Agricultural research began with the establishment, at Poona in 1889, of a Central Veterinary Research Institute. This was moved to Mukteswar in the United Provinces (Uttar Pradesh) in 1893. A Central Agricultural Research Institute formed at Pusa, Bihar, in

Central Food Technological Research Institute, Mysore

1903, was later moved to New Delhi and renamed the Indian Agricultural Research Institute.

The Indian Council of Agricultural Research (ICAR) was brought into being as a Registered Society in 1929 to develop and co-ordinate agricultural research and to disseminate research information. Under its aegis an Indian Council of Agricultural Education has been set up to co-ordinate agricultural and animal husbandry education.

The ICAR does not maintain any research laboratories of its own but finances research schemes in Central and State research institutions, universities and private laboratories. There are six central research institutes, namely the Indian Agricultural Research Institute, the Indian Veterinary Research Institute, the Central Dairy Research Institute, the Central Rice Research Institute, the Central Potato Research Institute and the Indian Institute of Sugar Cane Research.

There are seven commodity committees devoted to research in specific commodities such as cotton, jute, coconut, tobacco, oilseeds, areca-nut and lac. These committees have their own laboratories and research institutions. Furthermore, the Directorate of Plant Protection and Plant Quarantine, under the Ministry of Agriculture, assists research in many ways.

The Central Marine Fisheries Research Station, Mandapam, carries out biological investigations on edible fish found in the coastal waters of the country. These include mackerel, sardines and marine prawns. Research stations have been set up in Bombay, the Gulf of Kutch, Visakhapatnam and the Andamans.

The Central Inland Fisheries Research Station, Calcutta, deals with inland fish. The work of the Institute has so far been confined to fish and fisheries of the Ganges and the Mahanadi basins, but the scope is to be enlarged to include the edible fish of ponds, lakes and reservoirs. Problems of water pollution and their effects on fish are also to be investigated.

FOREST RESEARCH

The Forest Research Institute and College (established about 1906) is one of the leading centres of forestry education and research in the world. It is under the control of the Ministry of Food and Agriculture. The work undertaken in the Institute is meant to deal primarily with the forestry problems and products peculiar to India and the neighbouring countries. The Institute also serves as a training centre for students and other workers. In 1951, the Institute was recognized by the Food and Agriculture Organization (FAO) of the United Nations as a centre for technical training in forestry for the South-East Asian Region.

MEDICAL RESEARCH

Medical research dates from the introduction of western medical services in the nineteenth century. In 1845, Surgeon-Major Dempster, in the course of his investigations into malaria in the Punjab, introduced what is known as the 'spleen rate' as a measure of malarial endemicity. This has since become a yardstick for measuring the incidence of malaria in many parts of the world. In 1906, a Central Research Institute was established at Kasauli, and similar institutes were later set up at Bombay and Madras. In 1912, the Indian Research Fund Association (now known as the Indian Council of Medical Research) was founded to foster and co-ordinate medical research. In 1921 the School of Tropical Medicine was established at Calcutta and in 1925 the Nutritional Research Laboratory at Coonoor. The work in India of Sir Ronald Ross (the discoverer of the transmission of malaria through mosquitoes) was crowned by the opening, in 1926, of a Malaria Research Bureau at Kasauli, which later became the Malaria Institute of India with headquarters at Delhi. Later in the 1940s, the All-India Institute of Hygiene and Public Health was established at Calcutta for the training of public health workers and for research into problems of preventive medicine.

The King Institute of Preventive Medicine, Guindy, Madras, conducts research and prepares bacterial vaccines, sterile solutions and therapeutic sera.

Research in tuberculosis and other chest diseases is in progress at the Vallabhbhai Patel Chest Institute, Delhi. Studies of the morphology of the tubercle bacilli and the effects on them of the different drugs constitute a special feature of its investigations.

The Lady Willingdon Leprosy Sanatorium at Chingleput and the Silver Jubilee Children's Clinic at Saidapet have been taken over from the Madras Government and converted into the Central Leprosy Research Institute.

The Haffkine Institute, Bombay, undertakes large-scale manufacture of vaccines, sera and other biological products, and carries out investigations into the processes involved in their manufacture. It has been functioning as the chief centre for investigations connected with the prevention and treatment of plague. The scope of the Institute's work has been enlarged to cover problems of nutrition, malaria and virus diseases.

Investigations on cancer are carried out at the Indian Cancer Research Centre, Bombay. Statistical surveys of the incidence of cancer in India have also been undertaken there.

Investigations in the Central Research Institute, Kasauli, relate to problems of microbiology, serology and biochemistry. The Institute maintains a pathological museum.

The Pasteur Institute located at Coonoor is engaged on research in rabies, influenza, anti-venom serum, tropical eosinophilia and serological reactions.

The activities of the Central Drugs Laboratory, Calcutta, centre round biological and chemical assays of drugs. The Laboratory maintains a herbarium, and tenders technical advice to industrial concerns manufacturing drugs.

ENGINEERING RESEARCH

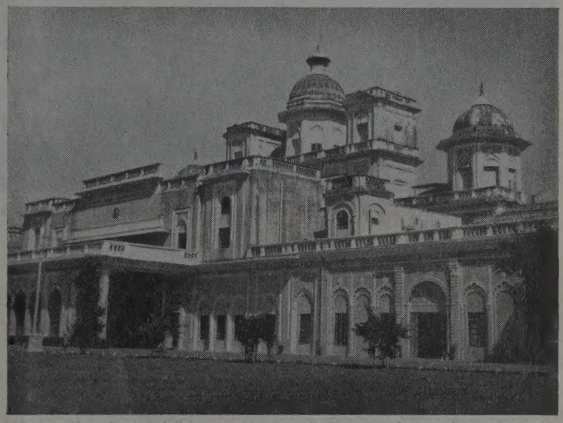
Many of the laboratories of the C.S.I.R. deal with engineering subjects, for instance the Road Research Institute, National Metallurgical Laboratory, Central Mining Research Station and the Central Mechanical Engineering Research Institute, in addition to the laboratories concerned with aeronautics and public health. There are eleven Hydraulic Research Stations under the Central Board of Irrigation and Power. The Central Water, Power, and Irrigation Research Centre, Khadakvasla (near Poona), is the pioneer hydraulic research station in India.

A Research and Development Directorate has been set up by the Ministry of Communications under the Director-General of Civil Aviation. It is concerned with type certification, manufacture of aircraft and development of specifications for aircraft materials.

The All-India Radio maintains a research unit in New Delhi to investigate problems relating to the propagation and reception of radio waves and the design and performance of radio receivers.

The Railway Board has its main research centre at Lucknow with sub-stations at Lonavla (near Poona) and Chittaranjan (West Bengal).

Many of the problems of road development and road materials, highways and bridge engineering, ports and harbours and so on, are dealt with by the Roads Organization, functioning under the Ministry of Transport.



The Central Drug Research Institute, formerly the Chattar Manzil Palace, Lucknow

The Indian Standards Institution, established some ten years ago, functions under the Ministry of Industries, and lays down standard specifications for materials and products.

Among other important research organizations financed by private endowments and Governmental assistance are:

the Indian Institute of Science, Bangalore, founded in 1909, for advanced instruction and also for original investigations in many branches of scientific knowledge;

the Bose Institute, Calcutta, engaged on research in physics, chemistry, plant physiology, plant breeding, cytogenetics, microbiology and zoology;

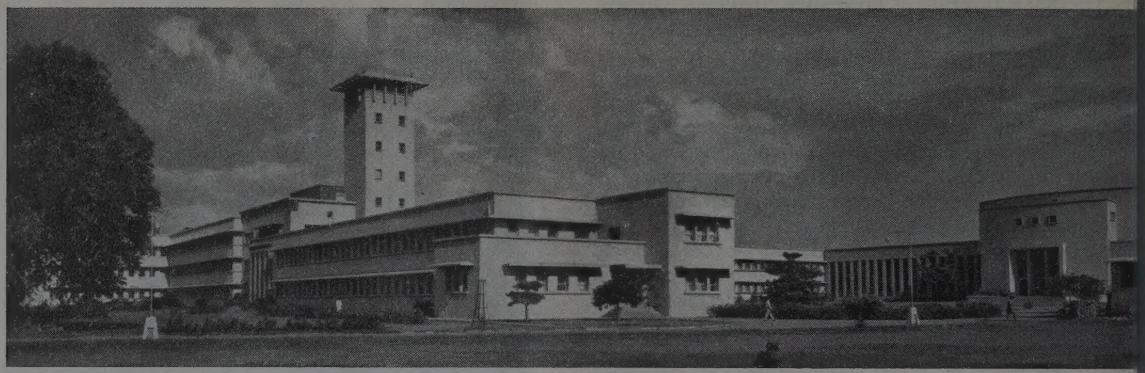
the Birbal Sahni Institute for Palaeobotany, Lucknow, for research on the fossil flora of India and related problems;

the Indian Association for the Cultivation of Science, Calcutta (which is one of the oldest research organizations in the country) for research in fundamental and applied physics and chemistry;

the Physics Research Laboratory, Ahmedabad, for research in atmospheric physics, cosmic rays, electronics, and theoretical physics;

the Shri Ram Institute in Delhi for Industrial Research on chemical and textile engineering problems;

the Raman Research Institute, Bangalore.



National Physical Laboratory, New Delhi

LEARNED SOCIETIES

In India, as in other countries, learned societies have greatly contributed to the sustained interest in the study of modern science.

The oldest learned society in India is the Asiastic Society of Bengal, originally the Asiatick Society, founded by Sir William Jones in Calcutta in 1784. From its activities have sprung many developments in science and technology, but it also embraces literature, history, archaeology and philology. The Indian Science Congress Association, which held its first meeting in 1914, is similar in nature to the British Association. At its annual meetings the progress of science in various fields is discussed. The National Institute of Sciences of India, established in 1925, is the nearest equivalent

Birla Industrial and Technological Museum, Calcutta

in India to the Royal Society of London. The Indian Academy of Sciences and the National Academy of Sciences are among other leading societies. There are several specialist societies: for Geology (founded 1906), Mathematics (1907), Botany (1921), Chemistry (1924), Physics (1934), Soil Science (1934) and Physiology (1934), and various professional societies for chemical engineers, telecommunication engineers, electro-technologists, applied physicists, biochemists, microbiologists, metallurgists and mining engineers. Some of these organizations have a long history: thus the Mining, Geological and Metallurgical Institute of India was founded over 50 years ago—in 1906. The Geological Survey of India was started over 100 years ago in 1851, the Botanical Survey in 1889, and the Archaeological Survey in 1862. Meteorological observations were made as far back as 1796.

The above résumé is concerned essentially with the developments which have taken place in the last 20 years and mainly in the last ten years. The amount of scientific interest and research in India is considerable. For some fields there is a long history, dating back 50 to 100 years to the pioneers, Indian or British, who foresaw the necessity for scientific research. In the main, however, the developments have occurred since the second world war. Although much of the research is oriented towards industry and industrial development, pure research is by no means neglected, even in the industrial laboratories. One might be forgiven for saying that 20 years ago India was not 'science-conscious': today the picture is different. Scientific training and research are recognized as of great importance in the national development and reconstruction. Also a scientific attitude of mind is being steadily inculcated in the various strata of society. At present in addition to the 24 national laboratories there are nearly 100 research institutions and research centres, there are over 50 associations for technological research; and some 40 universities where great attention is paid to science and scientific investigations.

It remains to say that in orienting the nation to this attitude of mind and in fostering a scientific approach to national problems, the influence of the Prime Minister of the country, Sri Jawaharlal Nehru, has been of major importance.

Book Reviews

MODERN ASPECTS OF INORGANIC CHEMISTRY. Third Edition. H. J. Emeléus and J. S. Anderson. Pp. xi + 611. *London: Routledge & Kegan Paul Ltd*, 1960. 35*s*.

This edition retains all the attractive features that have been responsible for the popularity of earlier editions. When the book was first published in 1938, it represented a new textbook approach to inorganic chemistry and was immediately recognized as such. For countless readers it transformed inorganic chemistry from a catalogue of dead facts into a buoyant and fascinating field of study. It correlated known data in such a way as to be really readable, and also made clear the stimulating possibilities in future investigations. 'Emeléus and Anderson' soon became synonymous with the new look in inorganic chemistry; the first edition was reprinted nine times, and the second edition issued in 1952 reflected the continued development of interest in inorganic chemistry. Since 1952 there have again been rapid advances in several of the main topics dealt with in the second edition, and it is indicative of the quality of the book that in spite of this it has maintained its popularity. This is largely because each chapter represented a well-considered introduction to the basic principles involved.

However, some aspects (such as coordination chemistry) have advanced so rapidly in recent years that a fresh treatment was clearly becoming essential, and it will therefore give great satisfaction to students and research workers alike to see that the authors have found time to prepare a third edition. The printing and general presentation are unchanged, but the text has been rearranged somewhat, and the opportunity has been taken throughout to bring the text up to date. Reference is made frequently to work published as late as 1958. This applies both to the chapters dealing with the chemistry of elements and their compounds and to those on theoretical aspects. Thus the discussion on the transuranium elements now includes reference to their separation, and the chapter on valency has been extended to include the treatment of molecular orbitals.

The biggest change has been made in the section dealing with coordination complexes. The two chapters in the earlier edition on coordination compounds and on metal carbonyls are replaced by four chapters, dealing with the Werner theory and inorganic stereochemistry; constitution and valency problems; stability and characteristic reactions; and metal carbonyls and other π-bonded complexes. These chapters are very well written indeed, and give a comprehensive treatment of the chemistry and structure of metal complexes (including complexes with aromatic systems) in terms of modern valency theory. Particularly noteworthy is the attention which is given to the mechanism of substitution in complexes. In this, the newest development in coordination chemistry, it is difficult to get an overall picture by reference to published papers, which are necessarily fragmentary. This account is probably the first attempt to present a readable review of the present position, and the authors have been highly successful.

The treatment of some topics which are now more familiar has been shortened, so that it has been possible to keep the volume at much the same size (611 pp. against 557 in the second edition). There seems to be no doubt that this new edition will be welcomed enthusiastically by everyone interested in inorganic chemistry. It is gratifying to note that the price is the same as for the second edition; this must reflect the publisher's confidence that the book will be well received.

C. C. ADDISON

THEORY OF UNIMOLECULAR REACTIONS. N. B. Slater. Pp. xi + 230. *London: Methuen & Co. Ltd*, 1960. 36*s*.

The mechanism of unimolecular reactions has excited the interest of physical chemists ever since the discovery that at high pressures the rates of gas-phase decompositions are frequently first-order in the concentration of the decomposing species. The general reason for this was first given by Lindemann, who suggested that there could be a time lag between the acquisition of activation energy by a molecule and its subsequent decomposition. In qualitative terms it was clear that the existence of such a time lag depended upon the molecule possessing a fairly large number of internal degrees of freedom, so that the activation energy might take a relatively long time to find its way to the weak point in the structure.

Dr Slater is well known for his contributions to the mathematical theory of this phenomenon, and in his new book he gives a well ordered and readable account of his own theoretical work and that of others on the theory of unimolecular reactions. Most of the theoretical work on this subject has been based on classical assumptions, but Dr Slater's book also goes briefly into the quantum mechanical extensions of the theory which have recently been put forward by him and other workers. The book is particularly useful, not only as an account of present theories, but also as indicating the problems which remain to be solved. Current theories are based primarily on the harmonic approximation, and it is not yet clear how they would be affected by the introduction of anharmonicity. Furthermore, it is not yet known whether the 'random phase approximation' gives a just description of an activated molecule.

In summary, Dr Slater's book is a valuable contribution to the literature of chemical kinetics and is to be recommended to all serious students of physical chemistry.

H. C. LONGUET-HIGGINS

INTERNATIONALE COLLOQUIUM ÜBER SCHNELLE REAKTIONENINLÖSUNGEN. Edited by M. Eigen. (*Z. Elektrochem.*, 1960, 64 (1), 1-204.) *Weinheim: Verlag Chemie GmbH*, 1960. DM 13.

This publication contains the papers and discussion contributions to a colloquium on fast reactions in solution held in the autumn of 1959. It constitutes one issue of the *Zeitschrift für Elektrochemie*, but is also obtainable separately. Although it makes no pretence at a systematic or complete treatment, it contains many papers of great interest and is a valuable source of reference to the literature of the subject.

The first section deals with flow methods, especially in their applications to reactions of biological interest. This is followed by a section on the use of electrochemical methods, such as polarography and the related techniques of electrolysis at constant current or at constant potential. Considerable advances have been made in the theory of this method, and one paper describes measurements with a rotating platinum cathode, which may be more suitable for many purposes than one with dropping mercury. The final sections of this part of the discussion are briefer, dealing respectively with magnetic resonance and fluorescence, flash methods and relaxation methods. All of these techniques show great possibilities for future application to kinetic problems, though so far they have not been used so extensively as flow and electrochemical methods.

The second part of the colloquium was devoted to the results obtained for specific reactions and the conclusions that can be drawn about their mechanisms. The range covered is very wide, and includes electron-transfer, hydration, complex formation, acid–base reactions, enzyme reactions, association, rotational isomerism and halogenation. It is interesting to note that the system carbon dioxide–water–carbonic acid has now been studied by nuclear magnetic resonance, and the results are consistent with those obtained by other methods. There are also papers on the general theory of fast processes in solution, especially those controlled by diffusion.

Many of the authors are themselves active in the study of fast reactions in solution, and the report gives an excellent impression of the present position of this work. As well as the formal papers there is a record of a lively discussion. Although the report is available in a standard journal, many institutions and individuals will find it very useful to have on their shelves as a separate volume.

R. P. BELL

MOLECULAR STRUCTURE. THE PHYSICAL APPROACH. J. C. D. Brand and J. C. Speakman. Pp. viii + 300. *London: Edward Arnold (Publishers) Ltd*, 1960. 30*s*.

The suggestion that most methods of investigation originate in physics laboratories, develop through physical and inorganic chemistry, and finally find their greatest field of application in the biochemical and biological sciences is probably too wide a generalization, but it does, nevertheless, contain a fair amount of truth. One of the most striking features of progress in the physical sciences over recent years has been the rapid way in which new techniques, developed by the physicist, have been taken over by the chemist and applied to chemical problems on both the physical and organic sides. It is fair to say that such developments form the main theme of this book.

Here 'Molecular Structure' is interpreted in the broadest way, and includes such subjects as the nature of bond properties, as well as the position of atoms within the molecule. Under 'The Physical Approach' the authors endeavour to summarize most of the new techniques developed over recent years, including nuclear magnetic resonance and electron diffraction, as well as the established methods of X-ray crystallography and infra-red and Raman spectroscopy. The description of physical methods, as used in the study of chemistry, has, of course, been the topic of many books before; but these have usually suffered either from too qualitative an approach, in which the general ideas of the techniques are described but no details supplied, or from too rigorous a mathematical approach, where the reader with no previous knowledge of quantum methods is lost at the beginning. The great advantage of the present book is that it takes nothing for granted and yet develops the necessary theory to a sufficient level for a full understanding of each topic discussed.

The first three chapters thus lay the basis for all the ideas required in the rest of the book. An historical and general introduction is followed by a chapter devoted to symmetry and its importance in crystal problems. One of the gratifying features of the text is that such rather abstract topics are approached via the simplest ideas with many examples included to illustrate the ideas involved. Thus symmetry properties in two dimensions are discussed fully before the three-dimensional groups are introduced. The third chapter is then devoted to wave mechanics, and again the mathematical knowledge assumed is only what any chemistry undergraduate should possess. The idea of an 'operator' is explained in detail, and the link between classical and wave-mechanics illustrated clearly. This chapter must be one of the most lucid and precise introductions to wave-mechanics available to chemistry students.

In the following chapters the basic theory is considered in relation to the various experimental techniques available for molecular structure analysis, beginning with the rotation of molecules and their investigation by infra-red and microwave spectroscopy. One chapter is then devoted to nuclear magnetic resonance and nuclear quadrupole resonance, with emphasis on their chemical applications; and a general analysis of the

vibrations and polarizability of molecules follows. Finally the methods of structure analysis by X-ray and electron diffraction are summarized, and particular attention is paid to the methods of analysing the experimental results, with 'the phase problem' discussed in detail.

The book closes with an appraisal of the results obtained by these various techniques and a general comparison between the different physical methods that have been described. There are also four short appendixes summarizing the more formal mathematical treatment, and this seems a wise arrangement, so that the general development of theory and method is not broken in the main text.

When considering the contents of the book as a whole, the reasons for the choice of contents are not altogether clear, such as why electron spin resonance is omitted when both nuclear magnetic resonance and microwave gaseous spectroscopy are included. There will always be difference of opinion on such points as these, however, and this does not detract from the very clear and coherent way in which the whole book is presented.

D. J. E. INGRAM

LOW-TEMPERATURE TECHNIQUES. F. Din and A. H. Cockett. Pp. viii + 216. *London: George Newnes Ltd*, 1960. 40*s*.

This volume, one of the series of Newnes Practical Science Books, describes various low-temperature techniques together with sufficient theory to make the object and method of carrying out the experiments intelligible. The book is written for the student, laboratory worker and technologist. Although original papers are not cited, recommendations are given at the end of each chapter for further reading.

Machines for the preparation of various cooling agents (*e.g.* liquid oxygen, nitrogen, hydrogen and helium but not, however, solid carbon dioxide) are described only briefly because it is assumed that these agents will be available commercially.

There is an excellent chapter on the measurement of low temperatures; it includes sections on thermocouples and on various aspects of thermometry—gas, vapour pressure, magnetic, resistance, platinum and industrial. Valuable tables present recommended sources of vapour pressure data and lists of fixed points. The latter are, however, disappointing because no indication is given of the status of the different points tabulated. For instance, whereas Table 7 contains one point with a temperature recognized by the 1948 International Temperature Scale it also contains other points with temperatures different from the recognized values. For example, the freezing point of mercury is quoted as −38·83°C whereas the value for this secondary fixed point is −38·87°C. Moreover some of the other points listed (*e.g.* the triple point of carbon dioxide) have received no official recognition.

Descriptions of low-temperature techniques used in the laboratory include the construction of cryostats and the measurement of physical constants. Much useful information on the properties of materials is given and the importance of this subject is well illustrated by an account (p. 195) of the disastrous failure due to embrittlement of a bulk-storage liquid-methane container constructed of a low carbon steel.

The chapter on gas separation, like the earlier one on the production of low temperatures, should be useful to students in preparing model answers.

The book is remarkably free from errors although there are a few, such as the piece of wire which has a diameter of 0·17 cm. on page 41 and one of 0·017 cm on page 96, to say nothing of the statement that 'large numbers of valves are now sired by bulls' (p. 200).

This book should be useful to anybody who has occasion to use low-temperature methods provided the reader has a sound knowledge of basic physics.

E. F. G. HERINGTON

GAS CHROMATOGRAPHY ABSTRACTS 1958. Edited by C. E. H. Knapman and C. G. Scott. Pp. vii + 262. *London: Butterworths Scientific Publications*, 1960. 42*s*.

This inaugural volume aims to be a complete collection of abstracts of publications on gas chromatography from the inception of the subject to the end of 1958. It is intended that *Gas Chromatography Abstracts* will become an annual publication, the first volume proper covering 1959. The Gas Chromatography Discussion Group, which is associated with the Hydrocarbon Research Group of the Institute of Petroleum, is to be congratulated on its initiative in sponsoring this work, the rapid publication of which was made possible by access to compilations already made by the BP Research Centre, the U.K. Atomic Energy Authority and Dr C. J. Hardy.

The volume under review contains 1,468 references, the great majority of which are abstracted in 2–6 lines of type. The references are listed alphabetically according to the name of the first author, and are followed by an author index and a subject index. Most of the British and American abstracts appear to have been made directly from the original papers, but for many foreign publications *Chemical Abstracts* seem to have been relied upon. This makes it doubtful if foreign publications are completely covered to the end of 1958. Otherwise, nothing of significance seems to have been omitted. A great effort has obviously been made to compile a subject index that will be really useful both to the analyst and the theoretical investigator; from a short examination the result appears to be excellent, and with the help of this index it is relatively easy to trace a publication, of which only the special feature may be remembered.

Adverse criticisms of this volume are minor ones. Thus there appears to be incomplete fusion of material

from different sources; for example, the language of the original article, when other than English, is not always indicated. The abbreviations of titles of journals are rather haphazard; the abbreviations used in the *World List of Scientific Periodicals* (also published by Butterworths!) could be used with advantage. Patent references, although quite comprehensible, are not uniform, as when the number of a British patent is preceded by B.P. (*e.g.* 407), but the numbers of German and United States patents are preceded by Ger. (*e.g.* 1399) and U.S. (*e.g.* 1190) respectively. Also, on pages 227–229, the page numbers in heavy type of the subject index classifications do not correspond to the pages on which these classifications begin.

This is a book which will deservedly be widely used in laboratories employing the powerful analytical technique of gas chromatography.

A. McLEAN

CHROMATOGRAPHIC REVIEWS. VOLUME II. Edited by M. Lederer. Pp. viii + 195. *Amsterdam: Elsevier Publishing Co.*; *London: D. Van Nostrand Ltd*, 1960. 46*s*.

The second volume of this series has maintained the high standard set by its predecessor. Like the articles in the earlier volume, the reviews have all been published in the *Journal of Chromatography*, and, since *Chromatographic Reviews* is all in English, translations have been made where necessary.

In the space of only 32 pages, Hardy and Pollard of Bristol have provided a useful, critical review of gas–liquid chromatography. All practical details of starch block electrophoresis and the way this technique opens and extends the electrophoretic separation of protein mixtures have been discussed by Bloemendal of Amsterdam.

Especially valuable is the paper by Biserte and his colleagues of Lille, on 1-fluoro-2,4-dinitrobenzene which has been widely used in the investigation of protein structure. The reagent readily reacts with the free α-amino groups of an amino acid, peptide or protein to form dinitrophenylamino derivatives, as well as with the thiol group of cysteine, the phenol group of tyrosine and the ω-amino groups of the diamino acids and the imidazole nucleus of histidine.

The recent applications of chromatography to the separation of the flavones and of the human haemoglobins are discussed by Harborne of the John Innes Horticultural Institution and by Prins of Amsterdam, respectively. This last technique is of particular importance in the investigations of certain hereditary abnormalities of haemoglobin synthesis which are throwing light on the genetic control of the synthesis of proteins. As a result of this technique, a whole series of haemoglobins have been identified and found to differ from each other only in respect of one amino acid or of a short polypeptide chain of a few amino acids.

The book concludes with a short account of the applications of inorganic adsorption and precipitation chromatography by Hayek of Innsbruck.

This book, which maintains the quality of production typical of Elsevier publications, will be invaluable to all chemists and biochemists.

C. H. GRAY

TEXT-BOOK OF METALLURGY. Second Edition. A. R. Bailey. Pp. x + 561. *London: Macmillan & Co. Ltd*; *New York: St Martin's Press Inc.*, 1960. 30*s*.

This edition, appearing only four years after the revised first edition, contains some new material and includes numerous modifications. The text can be considered in three sections, dealing with the physical, the extraction and the fabrication (or engineering) aspects of metallurgy. The major additions appear in the physical metallurgy section and include such topics as crystal imperfections and the theory of dislocations. The sections dealing with binary alloys and the structure and changes in solid alloys have also been enlarged to include a discussion on diffusion and to introduce the Kirkendall effect. Altogether the edition will provide the student with a most useful introduction to physical metallurgy.

The changes to the chapters dealing with extraction and fabrication metallurgy have been less extensive. Nevertheless they include a useful six-page addition on zone refining and a three-page appendix on the zinc blast furnace. Two short sections dealing with the recovery of titanium and uranium have also been added; these include descriptions of the Kroll process, of ion exchange and of solvent extraction. However, the latter process has not yet been operated in pulp as was suggested in the text. The author, by attempting to cover every process and combination of processes at an introductory level, may tend to confuse the beginner. A more detailed exposition of the basic principles of the various processes, together with just a few examples, would have promoted a deeper understanding of extraction metallurgy. The section on physico-chemical principles is not sufficiently rigorous to enable the student to understand clearly the concepts of enthalpy, internal energy and free energy.

Further additions to the volume include some extra equilibrium diagrams, which now number 28. There is also an appendix providing notes on writing metallurgical reports, and this should be of great assistance in indicating to the student how to present his results and opinions in a concise and orderly manner.

In view of the current price of technical books, the publishers are to be congratulated on producing a volume of approximately 600 pages and 450 illustrations for 30*s*., which must be considered excellent value. It is unfortunate, however, that the author did not take the advice of an earlier reviewer and include the word 'introductory' in the title.

A. V. BRADSHAW

Institute Affairs

British Standards Institution.—The Council has nominated Mr G. N. Copley, *Fellow*, as representative of the Institute on Technical Committee USM/2—Letter Symbols and Abbreviations, in succession to Dr H. J. T. Ellingham, who had been closely associated with the work of this Committee and its predecessors for over twenty years, and had served as its Chairman during the period when BS 1991—*Letter Symbols, Signs and Abbreviations*, Part I, General, was prepared.

National College of Food Technology.—The College has now been rehoused at St George's Avenue, Weybridge, Surrey, where it is intended that it shall concentrate on the national aspects of the work it has carried out since its inception, and arrangements are in hand for the regional and local work to be taken over this summer by the London County Council. In view of this concentration of the work of the College on a narrower front, the Minister of Education proposes, with the agreement of the Governors, to introduce a new constitution of the Governing Body, with effect from 1 August.

In response to an invitation from the Ministry, the Council has nominated Miss M. Olliver as a prospective Governor under the revised constitution. Miss Olliver has represented the Institute on the Governing Body of the College since its establishment and has taken a great interest in its development in recent years.

Register of Fellows and Associates, 1960.—A new edition of the *Register* is about to be prepared and will contain the names, qualifications, addresses and occupations of all who are Fellows, Associates or Graduate Members of the Institute on 31 October, 1960.

Cards on which to enter particulars will be sent to Fellows, Associates and Graduate Members overseas in September. These members will be asked to fill in the card and return it to the Institute immediately, preferably by air-mail.

Fellows, Associates and Graduate Members in Great Britain and Ireland will receive their cards in October.

Special Gift to the Benevolent Fund.—The Chairman and members of the Benevolent Fund Committee gratefully acknowledge a contribution of £20 sent as a special gift 'in memory of Lucy (*née* Sims), the courageous mother of a Fellow.'

Humphry Davy Lecture.—Professor V. N. Kondratiev, Member of the U.S.S.R. Academy of Sciences, has agreed to give the Second Humphry Davy Lecture at the Royal Institution, 21 Albemarle Street, London, W.1, on Wednesday, 12 October at 7 p.m. The title of the address will be 'Energy Exchange in the Interaction of Particles under Electric Discharge'. Light refreshments will be available from 6.30 to 7 p.m.

Joint IRI-PI Examination Scheme.—The Institution of the Rubber Industry and the Plastics Institute have agreed to establish a joint examination scheme and to set up for this purpose a Joint Examinations Board consisting of four representatives of each of the two bodies, together with a representative of the Royal Institute of Chemistry. The Council has been pleased to accept the invitation to collaborate in the work of the Joint Examinations Board, and has nominated Mr George Dring, *Member of Council*, as representative of the Institute on the Board.

R.I.C. Series of Filmstrips.—The second item in the new series of R.I.C. filmstrips has recently been published by Common Ground Ltd. It is entitled *Optical Isomerism* and has been compiled by Mr E. H. Coulson, Senior Science Master, Braintree High School, Essex. It is suitable for VIth forms and colleges.

Copies of this filmstrip, complete with teaching notes, may be obtained from the Educational Supply Association, 181 High Holborn, London, W.C.1, price 25*s*. each.

PERSONAL NOTES

Birthday Honours

The Officers and Council extend their cordial congratulations to the following Members, whose names appeared in the Birthday Honours List:

Knight Bachelor	George Beresford CRADDOCK, M.A., B.SC., M.P., *Barrister-at-Law*
C.B.	Frederick Measham LEA, C.B.E., D.SC., HON. A.R.I.B.A.
C.M.G.	Arthur Franklyn WILLIAMS, B.SC.
C.B.E.	John Stanley CARTER, O.B.E., M.SC., PH.D.
O.B.E.	Herbert Whincup GLOYNE, B.SC.
	Martin LOVETT, B.SC., F.INST.S.P.
	Albert Arthur SMALES, B.SC.
	Ferdinand Bernard THOLE, D.SC., F.INST.PET.
M.B.E.	Herbert Edward HUDSON, B.SC., PH.D.
	William KEANE.

Honours and Awards

Professor H. J. Emeléus, C.B.E., F.R.S., *Fellow*, was awarded an Honorary Doctorate of the University of Lille at the Fourth Centenary Celebrations of the University held on 4 June.

Mr E. Le Q. Herbert, *President*, Managing Director of the Shell Refining Co. Ltd, has been invited to be a Vice-President of Honour of the Pure Food Centenary.

Professor E. L. Hirst, C.B.E., F.R.S., *Fellow*, of the University of Edinburgh, has been elected an honorary member of the Polish Chemical Society.

Dr T. D. Whittet, *Fellow*, chief pharmacist and lecturer in pharmacy at University College Hospital, has been awarded the Evans Medal for merit in pharmacy.

Societies and Institutions

Sir Alexander Fleck, K.B.E., F.R.S., *Fellow*, is to open the Symposium on 'Powders in Industry: Properties and Principles of Application' organized by the Surface Activity Group of the Society of Chemical Industry. It will be held on 29–30 September at the Royal Institution, London, and Sir Alexander will be President of Honour.

Mr A. A. B. Harvey, *Fellow*, Director of Technical Services, Sunbeam Anti-Corrosive Ltd, has succeeded Dr T. P. Hoar, *Fellow*, as President of the Institute of Metal Finishing.

Dr F. S. H. Head, *Fellow*, has recently been elected Chairman of the National Executive Committee of the Ramblers' Association.

Mr G. W. Lee, *Fellow*, Director of the British Coke Research Association, presented a paper entitled 'Recent Developments in British Coal Carbonization Research' to the 1960 Conference of the American Institute of Mining, Metallurgical and Petroleum Engineers, on 4 April. Mr Lee also acted as co-chairman of the Coke Session.

Dr R. Lessing, C.B.E., *Fellow*, has been elected a vice-chairman of the British Chemical Plant Manufacturers' Association.

Dr H. A. Thomas, *Fellow*, marketing manager (technical) of the Marketing Division, Courtaulds Ltd, is to deliver the Plastics Institute's Young People's Lecture at the Institution of Electrical Engineers, Savoy Place, London, W.C.2, on 30 December.

Institution of Gas Engineers.—Dr D. T. A. Townend, C.B.E., *Fellow*, has been awarded the Birmingham Medal, 1960. Dr M. J. F. Olden, *Associate*, has been awarded the Silver Medal, 1959, for a paper on the primary flash distillate in conventional carbonizing plant.

Nutrition Society.—At a recent meeting of the Nutrition Society, the following *Fellows* were elected in the capacities stated: Hon. Secretary, Dr R. J. L. Allen; Hon. Treasurer, Dr W. F. J. Cuthbertson; Ordinary Members of Council, Dr F. Aylward and Professor A. Neuberger, F.R.S.

Society of Dyers and Colourists.—Mr Clifford Paine, *Fellow*, has been presented with the illuminated address of honorary membership of the Society of Dyers and Colourists. He is a past president of the Society. The Society awarded the Perkin Medal to Dr C. J. T. Cronshaw, *Fellow*, for work on phthalocyanine pigments and derived textile dyes, and to Mr J. T. Marsh, *Fellow*, for contributions in the field of textile chemistry.

Educational

Dr C. C. Addison, *Fellow*, has been elected Professor of Inorganic Chemistry at the University of Nottingham, as from 1 October. He is at present Reader in the Department of Chemistry.

Dr Colin H. Doy, *Associate*, of Melbourne, has taken up a C.S.I.R.O. Postgraduate Overseas Studentship in the Department of Bacteriology and Immunology, Harvard Medical School, Boston.

Dr J. W. Fairbairn, *Fellow*, has had the title of Professor of Pharmacognosy in the University of London conferred upon him in respect of his post at the School of Pharmacy.

Dr B. C. Haldar, *Fellow*, has been appointed Professor of Inorganic Chemistry at the Institute of Science, Bombay, on transfer from Gujarath College, Ahmedabad.

Dr D. Inman, *Associate*, has been appointed an Imperial Chemical Industries Research Fellow at the University of Reading.

Dr W. Klyne, *Fellow*, Reader in Biochemistry at the Postgraduate Medical School of London, has been appointed to the University Chair of Chemistry, tenable at Westfield College.

Dr Beryl Rickard, *Associate*, has left Imperial College, London, to take up a post-doctoral research fellowship in fungal physiology at the University of Wisconsin, U.S.A.

Dr D. M. Robertson, *Associate*, has been awarded a Portsmouth Fellowship for neurochemical research in connection with multiple sclerosis.

Dr A. E. Scott, *Associate*, has been appointed lecturer with administrative responsibilities to the Departments of Chemistry, University of Bristol.

Dr R. A. Shaw, *Fellow*, of Birkbeck College, has been invited to lecture on phosphorus–nitrogen compounds to the Inorganic Section of the Gordon Conference, which will be held at the University of Rhode Island on 22-26 August, under the auspices of the American Association for the Advancement of Science.

Dr C. F. Slade, *Associate*, has been appointed a senior lecturer at the University of Reading.

Mr F. T. B. Smyth, *Graduate Member*, now holds the position of Research Associate at Brown University, Rhode Island.

Dr J. W. Sutherland, *Associate*, has been appointed an Imperial Chemical Industries Research Fellow at the University of Edinburgh.

Dr M. C. R. Symons, *Associate*, of the Chemistry Department, University of Southampton, has been appointed to the Chair of Physical Chemistry, University of Leicester, as from 1 October.

Dr F. Vella, *Associate*, has resigned his post as lecturer in biochemistry at the University of Malaya to take up a senior lectureship in the Department of Biochemistry, University of Khartoum.

Dr W. A. Waters, *Fellow*, formerly university demonstrator in organic chemistry, has been appointed reader in physical organic chemistry, University of Oxford.

Professor T. S. Wheeler, *Fellow*, of University College, Dublin, is going on an extensive lecture tour from July

to December. His itinerary includes visits to India, Formosa, Japan, Canada and the United States; he will also attend the IUPAC Symposium on the Chemistry of Natural Products to be held in Australia in August.

Academic Visitors to the United Kingdom.—The following members of staff of oversea Commonwealth Universities are expected to be in the U.K. until the dates stated: Dr K. P. Ang, *Associate* (Malaya), October; Professor L. J. Haynes, *Fellow* (West Indies U.C.), October; Professor G. C. Israel, *Fellow* (Ghana U.C.), September; Professor D. O. Jordan, *Fellow* (Adelaide), January, 1961; Mrs W. P. D. Pereira, *Associate* (Ceylon), September, 1961; Mr T. Thirunamachandran, *Associate* (Ceylon), September, 1961; Dr D. Vir, *Associate* (Panjab), January, 1962.

The following are due to arrive shortly, at about the dates stated: Dr A. D. Campbell, *Associate* (Otago), December; Dr J. W. Clark-Lewis, *Fellow* (Adelaide), October; Professor F. H. Reuter, *Fellow* (New South Wales), August.

N.R.C. Postgraduate Fellowships.—The following members have terminated their postgraduate fellowships at Ottawa: Dr A. D. Osborne, *Graduate Member*, is now at the Division of Physical Sciences, University of California; Dr B. S. W. Smith, *Associate*, is with the Animal Diseases Research Association, Moredun Institute, Edinburgh; Dr H. M. Smith, *Associate*, is working for Imperial Chemical Industries Ltd, Paints Division, Slough; and Dr J. C. J. Thynne, *Associate*, is at the University of California, Department of Chemistry.

Public and Industrial

Mr J. S. Baker, *Fellow*, has been appointed managing director of Merck Sharp & Dohme (Australia) Pty Ltd. He was formerly works director of the company.

Mr M. A. L. Banks, *Fellow*, general manager of the Refineries and Technical Department, British Petroleum Co. Ltd, has been appointed a director of the company.

Sir Charles Dodds, M.V.O., F.R.S., *Fellow*, Courtauld Professor of Biochemistry in the University of London, is to be Chairman of the Inter-Departmental Advisory Committee on poisonous substances used in agriculture and food storage.

Dr B. S. Gorringe, *Associate*, is now development manager, John and E. Sturge Ltd, King's Norton, Birmingham.

Dr H. Hollings, O.B.E., *Fellow*, has been elected Chairman of Nordac Ltd of Uxbridge. He is also a director of British Carbo Norit Union Ltd and United Analysts Ltd, and represents the University of Leeds on the joint committee with the Gas Council.

Dr H. T. Hookway, *Fellow*, Assistant Director, National Chemical Laboratory, has been appointed Director of the U.K. Scientific Mission in Washington, and Scientific Attaché at the British Embassy there. He succeeds Mr E. S. Hiscocks, *Fellow*, who is to become Director of the Tropical Products Institute.

Mr R. M. Lavender, *Associate*, has taken up an appointment with Polyresin Products Ltd, Durban, as a senior chemist. He was formerly chief chemist with Herbert Evans & Co. of Durban.

Professor Sir Alexander Todd, F.R.S., *Fellow*, has been elected Upper Warden of the Salters' Company for the ensuing year.

Mr R. F. G. Trewick, *Associate*, has taken up the appointment of Managing Director of Evans Medical (India) Private Ltd. He has already spent three years in Burma.

Mr G. Tunstall, *Fellow*, has taken up an appointment as manager, manufacturing and packaging, with E. R. Squibb & Sons Ltd, Speke, Liverpool. He was formerly with Cadbury Bros Ltd.

Sir Walter Worboys, *Fellow*, has been elected Chairman of B.T.R. Industries Ltd, in succession to Sir Graham Hayman. He has also been appointed a part-time member of the board of B.O.A.C.

Food Research Advisory Committee.—The following *Fellows* are members of the Food Research Advisory Committee, appointed 'to advise on those food problems requiring investigation or research which should be undertaken with the aid of public funds, and to make recommendations as to the priorities to be accorded to such problems': Sir Charles Dodds, M.V.O., F.R.S., Sir William Slater, K.B.E., F.R.S., and Dr J. A. B. Smith, C.B.E., F.R.S.E.

Food Standards Committee.—Mr R. Groves, *Fellow*, has been appointed Chairman of the reconstituted Food Standards Committee. The following *Fellows* have been appointed members: Mr C. A. Adams, C.B.E., Mr A. Glover, O.B.E., and Mr P. McGregor.

Retirements

Dr A. W. Baldwin, *Associate*, has retired after 38 years with Imperial Chemical Industries Ltd and its predecessors. He was an associate research manager of the Dyestuffs Division.

Mr A. J. Crockatt, *Fellow*, retired as director of Eastmans, Dyers and Cleaners Ltd, and other firms on 1 January.

Dr J. S. Dunn, *Associate*, has retired from his post with Imperial Chemical Industries Ltd, Billingham Division.

Mr James Grant, *Associate*, general manager of the Shell Haven refinery of Shell Refining Co. Ltd, has retired.

Mr R. B. Harley, *Fellow*, has retired from his post as a consultant to Thomas de la Rue & Co. Ltd.

Mr F. W. F. Hendry, *Fellow*, lecturer in chemistry at the Mid-Essex Technical College and School of Art and Institute Liaison Officer in the College, is retiring on 15 July.

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Robert Albert Ernest GALLEY, B.SC., PH.D., A.R.C.S., D.I.C. : *Overseas*

Donald Clarence GARRATT, PH.D., D.SC.

Frederick Denison Maurice HOCKING, M.SC., M.B., B.S., M.R.C.S., L.R.C.P., A.C.G.F.C., M.I.BIOL. : *Bristol and District; South-Western Counties*

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Mamie OLLIVER, M.SC.

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David WOODCOCK, PH.D., D.SC.

Leslie YOUNG, PH.D., D.SC., A.R.C.S.

(District Members of Council are indicated by references in italics to the Local Section(s) within their Districts)

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Sir Christopher INGOLD, F.R.S.
Sir Harry JEPHCOTT
Douglas William KENT-JONES

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Examiners for Graduate Membership: Part I: C. C. ADDISON, PH.D., D.SC. (DUNELM.), F.INST.P.; D. J. G. IVES, PH.D., D.SC. (LOND.), A.R.C.S., D.I.C.; F. G. MANN, SC.D. (CANTAB.), D.SC. (LOND.), F.R.S.
Part II: C. W. DAVIES, D.SC. (WALES); W. G. OVEREND, PH.D., D.SC. (BIRM.); A. G. SHARPE, M.A., PH.D. (CANTAB.)

Examiners for Diplomas in Applied Chemistry:

Branch A.—General Analytical Chemistry: R. C. CHIRNSIDE; J. HASLAM, D.SC. (MANC.)
Branch B.—Applied Biochemistry: R. A. MORTON, PH.D., D.SC. (LIV.), F.R.S.
Branch C.—Agricultural Chemistry: C. TYLER, B.SC., PH.D. (LEEDS)
Branch D.—Clinical Chemistry: E. J. KING, M.A., PH.D. (TORONTO), D.SC. (LOND.); W. KLYNE, M.A., B.SC. (OXON.), PH.D. (EDIN.)
Branch E.—The Chemistry, including Microscopy, of Food, Drugs and Water: T. MCLACHLAN, D.C.M., A.C.G.F.C., M.I.BIOL.; H. E. ARCHER, M.R.C.S. (ENG.), L.R.C.P. (LOND.)
Branch F.—The Chemistry of Water Supplies and the Treatment of Sewage and Trade Effluents: J. G. SHERRATT, B.SC. (MANC.)
Branch G.—Industrial Chemistry: W. PRESTON, M.SC., PH.D. (LOND.), M.I.CHEM.E. Examiners in the special sections of Branch G will be appointed as required

Assistant Examiners: A. D. MITCHELL, D.SC. (LOND.); E. A. W. HEBDON, B.SC. (LOND.)

Special Examiners: H. V. A. BRISCOE, M.SC. (DUNELM.), D.SC. (LOND.), A.R.C.S., D.I.C.; J. R. NICHOLLS, C.B.E., D.SC. (LOND.)

HON. AUDITORS 1960-61

Denys Irvine COOMBER, B.SC., PH.D.
K. G. A. PANKHURST, PH.D., D.SC.

AUDITORS 1960-61

Messrs J. Y. FINLAY, ROBERTSON & CO., *Chartered Accountants*

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Dennis Alen ARNOLD, F.C.I.S.

Assistant Secretary (Scientific)
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Assistant Registrar
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Education Officer
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Finance Officer
John Frederick HARDING, A.C.I.S.

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(Committees and Sub-Committees for membership of which only present members of Council are eligible, are marked with an asterisk)

**Finance and House Committee:* The PRESIDENT, The HON. TREASURER (Chairman), Dr C. M. CAWLEY, C.B.E., Mr G. DRING, Dr S. J. FLETCHER, Dr C. W. HERD, Dr F. A. ROBINSON, Dr C. SIMONS, Dr A. J. V. UNDERWOOD, Mr E. J. VAUGHAN, with Mr J. F. HARDING as Secretary.

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Education Committee: The PRESIDENT, Professor R. A. MORTON, F.R.S. (Chairman), Dr H. J. BARBER, Dr R. W. BOLLAND, Professor H. BURTON, Professor F. CHALLENGER, Mr E. H. COULSON, Dr R. L. ELLIOTT, Mr G. H. MOORE, Miss M. OLLIVER, Mr L. P. PRIESTLEY, Dr J. H. PRYOR, Dr G. R. RAMAGE, Professor P. D. RITCHIE, Dr J. H. SKELLON, Mr E. J. VAUGHAN, with co-opted SCIENCE MASTERS and SCIENCE MISTRESSES, and with Mr D. G. CHISMAN as Secretary

**Membership Committee:* The President, Mr E. J. VAUGHAN (Chairman), Mr G. DRING (Vice-Chairman), the other HON. OFFICERS and MEMBERS OF THE COUNCIL, with Mr L. W. WINDER as Secretary

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Sub-Committee on Indian and Pakistani Applications: The CHAIRMAN of the MEMBERSHIP COMMITTEE, Dr C. FORRESTER (Chairman), Mr A. A. ELDRIDGE, Dr D. A. FRYE, Dr G. E. GALE, with Mr L. W. WINDER as Secretary

Sub-Committee for Special Examinations: The CHAIRMAN of the MEMBERSHIP COMMITTEE, Professor H. V. A. BRISCOE (Chairman), Mr G. DRING, Professor E. D. HUGHES, F.R.S., Dr J. R. NICHOLLS, C.B.E., with Mr L. W. WINDER as Secretary

Panel on Exempting Qualifications: The CHAIRMAN of the MEMBERSHIP COMMITTEE, Professor H. BURTON (Chairman), with Professor E. D. HUGHES, F.R.S., and Dr J. W. SMITH as Assessors and Mr L. W. WINDER as Secretary

Study Group on Qualifications: The PRESIDENT, Mr E. J. VAUGHAN (Chairman), Mr L. BALMFORTH, Dr N. BOOTH, Professor W. BRADLEY, Dr C. M. CAWLEY, C.B.E., Dr F. HARTLEY, Dr C. W. HERD, Dr G. R. RAMAGE, Dr F. A. ROBINSON, Dr C. SIMONS, Professor R. L. WAIN, F.R.S., Professor L. YOUNG, with Dr H. J. T. ELLINGHAM as Secretary

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Panel on Ancillary Subjects: The CHAIRMAN of the INSTITUTIONS COMMITTEE, with Dr J. W. SMITH and Dr A. F. H. WARD as Assessors, and with Mr D. G. CHISMAN as Secretary

Publications Committee: The PRESIDENT, Dr C. W. HERD (Chairman), Dr W. R. ANGUS, Mr G. DRING, Dr R. L. ELLIOTT, Dr F. D. M. HOCKING, Professor C. KEMBALL, Mr W. F. KIRKPATRICK, Professor R. A. MORTON, F.R.S., Miss M. OLLIVER, Dr R. E. PARKER, Dr F. A. ROBINSON, Dr A. J. V. UNDERWOOD, Dr M. B. WATSON, Dr D. WOODCOCK, Professor L. YOUNG, with Dr F. W. GIBBS as Secretary

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(*b*) With the Scottish Education Department: Dr J. BELL, Dr J. K. GRANT, Dr T. G. H. THOMSON, Professor A. D. WALSH. (Dr R. B. STRATHDEE, O.B.E., is Chairman)
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The Poisons Board (Pharmacy and Poisons Act, Northern Ireland, 1955): Professor C. L. WILSON
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British National Committee for Chemistry (Royal Society): Mr R. C. CHIRNSIDE
Chemical Divisional Council of the British Standards Institution: Dr F. HARTLEY
British Biological Stains Committee: Professor W. BRADLEY
Corday-Morgan Memorial Executive: The PRESIDENT, (The IMMEDIATE PAST PRESIDENT)
Scientific Film Association: Mr D. M. FREELAND
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Professional Classes Aid Council: The SECRETARY

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National Council for Technological Awards

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University of Hull: Mr R. S. HOWARD
University of Nottingham: Mr C. F. WARD
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Bradford Institute of Technology: Professor F. CHALLENGER
Bristol College of Technology: Dr C. R. OSWIN
Cardiff, Welsh College of Advanced Technology: Mr P. J. C. HAYWOOD
Darlington College of Further Education: Mr W. C. J. SMITH
Kingston-upon-Thames Technical College: Dr J. IDRIS JONES
London, Brunel College of Technology (Acton): Mr R. C. CHIRNSIDE
London, Hackney Technical College: Mr A. J. TURNBULL
London, Norwood Technical College: Mr S. G. E. STEVENS
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Newcastle upon Tyne, College of Further Education: Dr J. GIBSON
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Yorkshire Council for Further Education: County Advisory Committee for Chemistry: Dr W. CULE DAVIES, Mr E. J. MILES, Dr R. R. PRITCHARD, Mr C. E. RHODES

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Bristol College of Technology: Mr A. J. EDWARDS
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Middlesbrough, Constantine Technical College: Dr D. A. SPRATT, Dr R. G. J. TELFER, Dr K. C. WARNE
Newcastle, Rutherford College of Technology: Dr J. O. HARRIS, Dr K. H. JACK
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Northampton College of Technology: Mr D. SWADDLE
Norwich City College: Dr J. W. CORRAN
Oxford College of Technology: Dr H. M. IRVING
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Portsmouth College of Technology: Dr G. T. BALL
Rotherham College of Technology: Dr R. A. MOTT
Salford, Royal Technical College: Dr S. J. FLETCHER
Salisbury and S. Wilts. College of Further Education: Mr L. C. THOMAS
Slough College of Further Education: Mr H. T. ISLIP
Southend-on-Sea Municipal College: Mr R. C. M. SMITH
Stockport College for Further Education: Dr A. F. DAGLISH
Stretford Technical College: Dr M. I. GILLIBRAND
Widnes Technical College: Dr A. J. HAM
Wolverhampton and Staffordshire College of Technology: Mr M. E. D. WINDRIDGE

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Union of Lancashire and Cheshire Institutes: Chemical Trades Advisory Committee and the Chemical Trades Examination Board: Dr L. R. RIDGWAY
City and Guilds of London Institute: Advisory Committees:—
Oils, Fats and Waxes: Mr W. H. SIMMONS
Dyeing of Textiles: Dr H. H. HODGSON
Laboratory Technicians Work: Mr R. C. ROGERS, Mr R. F. W. SELMAN, Dr J. H. SKELLON

LIAISON OFFICERS IN TECHNICAL COLLEGES

Technical Colleges are arranged alphabetically under the Regions of the Advisory Councils for Further Education. The letter on the left of each entry signifies the Local Section in whose area the college is situated (for key, *see J.*, 46)

Colleges recognized to the level of Part I only of the Graduate Membership Examination are marked with an asterisk

ENGLAND AND WALES

I. LONDON AND HOME COUNTIES

(P)	Brighton Technical College	Dr E. G. COWLEY, Head, Department of Chemistry
(P)	Chatham, Medway College of Technology	Dr C. E. SEAMAN, Head, Department of Science
(P)	Dagenham, S.E. Essex Technical College	Mr J. RATCLIFFE, Head, Department of Chemistry and Biology
(P)	*Dartford, N.W. Kent College of Technology	Mr J. R. BARR, Head, Department of Science
(P)	*Guildford County Technical College	Mr J. C. BEVAN, Senior Lecturer in Chemistry
(P)	Hatfield Technical College	Dr F. LESTER, Head, Department of Science
(P)	Kingston-on-Thames Technical College	Mr N. LINDOP, Head, Department of Chemistry and Biology
(P)	London, Brunel College of Technology (Acton)	Dr J. H. SKELLON, Head, Department of Chemistry
(P)	London, Battersea College of Technology	Dr J. E. SALMON, Head, Department of Chemistry
(P)	London, Borough Polytechnic	Dr F. X. AYLWARD, Head, Department of Chemistry and Food Technology
(P)	London, Chelsea College of Science and Technology	Dr A. M. JAMES, Reader in Chemistry
(P)	London, Northampton College of Advanced Technology	Dr J. LEICESTER, Head, Department of Applied Chemistry
(P)	London, Northern Polytechnic	Dr W. GERRARD, Head, Department of Chemistry
(P)	London, Norwood Technical College	Mr M. A. FILL, Acting Head, Department of Chemistry and Biology
(P)	London, The Polytechnic, Regent Street	Mr C. W. HYDE, Head, Department of Chemistry and Biology
(P)	London, Sir John Cass College	Dr A. J. LINDSEY, Head, Department of Chemistry
(P)	London, S.W. Essex Technical College (Walthamstow)	Dr S. LEWIN, Head, Department of Science
(P)	London, West Ham College of Technology	Dr F. L. ALLEN, Head, Department of Chemistry and Biology
(P)	London, Woolwich Polytechnic	Dr A. I. VOGEL, Head, Department of Chemistry
(P)	Luton College of Technology	Miss N. BOOTHMAN, Head, Department of Science
(P)	Slough College of Further Education	Dr B. W. V. HAWES, Head, Department of Science
(P)	*Southend-on-Sea Municipal College	Mr C. R. BARNES, Head, Department of Science

II. SOUTHERN

(R)	Bournemouth Municipal College of Technology	Dr C. J. COOPER, Head, Department of Science
(Y)	Oxford College of Technology, Art and Commerce	Mr E. J. H. BIRCH, Senior Lecturer in Chemistry
(R)	Portsmouth College of Technology	Mr C. M. BERE, Head, Department of Chemistry and Biology
(Y)	*Reading Technical College	Dr A. M. BERYL WHITAKER, Senior Lecturer in Chemistry

III. SOUTH WEST

(D)	Bristol College of Technology	Dr R. W. BOLLAND, Head, Department of Chemistry and Biology
(D)	Gloucester Technical College	Dr R. B. WILLIAMS, Head, Department of Science
(W)	Plymouth and Devonport Technical College	Dr A. B. MEGGY, Head, Department of Chemistry

IV. WEST MIDLANDS

(C)	Birmingham College of Advanced Technology	Dr W. G. S. PARKER, Head, Department of Chemistry
(C)	Coventry, Lanchester College of Technology	Dr M. E. FOSS, Head, Department of Chemistry, Metallurgy and Textiles

(C)	*Smethwick, Chance Technical College	Mr T. W. HAY, Head, Department of Science
(C)	Stoke-on-Trent, N. Staffs. Technical College	Mr W. K. WILDE, Head, Department of Chemistry and Metallurgy
(C)	Wolverhampton and Staffs. College of Technology	Dr A. G. CATCHPOLE, Head, Department of Applied Science
V.	EAST MIDLANDS	
(H)	Derby and District College of Technology	Dr C. M. ATKINSON, Head, Department of Chemistry
(H)	Leicester College of Technology and Commerce	Mr L. P. PRIESTLEY, Head of the School of Chemistry
(H)	Loughborough College of Technology	Dr R. F. PHILLIPS, Head, Department of Applied Chemistry
(C)	*Northampton College of Technology	Dr W. SIDDALL, Head, Department of Science
(H)	Nottingham and District Technical College	Mr J. R. ROWLANDS, Head, Department of Science
(M)	*Scunthorpe, N. Lindsey Technical College	Mr G. REDPATH, Head, Department of Science and Metallurgy
VI.	EAST ANGLIA	
(P)	*Cambridgeshire Technical College	Mr P. S. JEWELL, Head, Department of Science
(P)	*Chelmsford, Mid-Essex Technical College	Mr F. W. F. HENDRY, Lecturer in Chemistry
(G)	*Ipswich Civic College	Mr H. S. HUNT, Head of the School of Science
(G)	Norwich, City College and Art School	Dr F. RODWELL, Senior Lecturer in Chemistry
VII.	YORKSHIRE	
(U)	*Barnsley College of Technology	Mr J. WILLIAMS, Head, Department of Science
(N)	Bradford Institute of Technology	Dr R. L. ELLIOTT, Head, Department of Chemistry and Dyeing
(U)	*Chesterfield College of Technology	Mr N. J. BOOTH, Head, Department of Chemistry and Metallurgy
(U)	*Doncaster Technical College	Mr W. F. ANDREWS, Head, Department of Science
(L)	*Halifax, The Percival Whitley College of Further Education	Dr L. HEY, Head, Department of Chemistry
(L)	Huddersfield College of Technology	Dr E. TITTENSOR, Head, Department of Chemistry and Dyeing
(M)	Hull College of Technology	Mr L. BALMFORTH, Head, Department of Chemistry and Biology
(N)	Leeds College of Technology	Dr W. R. BURNHAM, Head, Department of Chemistry and Biology
(X)	Middlesbrough, Constantine Technical College	Dr V. MOSS, Head, Department of Science and Metallurgy
(U)	Rotherham College of Technology	Mr G. ROBINSON, Lecturer in Chemistry
(U)	Sheffield College of Technology	Mr A. B. ANGUS, Senior Lecturer in Chemistry
VIII.	NORTH WEST	
(O)	Birkenhead Technical College	Mr D. G. COOPER, Head, Department of Science
(SS)	Blackburn Technical College	Mr A. WALTON, Head, Department of Science
(Q)	Bolton Technical College	Dr G. W. WOOD, Head, Department of Science
(SS)	Burnley Municipal College	Mr G. BROUGHTON, Lecturer in Chemistry
(Q)	*Bury Technical College	Mr D. G. CROSSE, Head, Department of Science
(O)	Eastham, Central College of Further Education, Carlett Park	Mr H. R. JONES, Head, Department of Science
(SS)	Lancaster and Morecambe College of Further Education	Mr R. Q. ANDERSON, Head, Department of Chemistry
(O)	Liverpool College of Technology	Dr K. S. W. SING, Head, Department of Chemistry and Biology
(Q)	*Oldham Municipal Technical College	Mr V. BLOOMER, Head, Department of Science
(SS)	Preston, The Harris College	Dr S. SKIDMORE, Head, Department of Chemistry and Biology
(O)	St Helens Technical College	Dr L. W. M. TYRRELL, Head, Department of Science
(Q)	Salford, The Royal Technical College	Dr G. R. RAMAGE, Head, Department of Chemistry and Applied Chemistry
(Q)	Stockport College for Further Education	Mr H. H. ARMSTRONG, Head, Department of Science
(O)	Widnes College of Further Education	Mr G. H. BOTTOMLEY, Head, Department of Chemistry
(O)	Wigan and District Mining and Technical College	Dr H. K. DEAN, Head, Department of Chemistry
IX.	NORTHERN	
(S)	Newcastle, Rutherford College of Technology	Mr L. H. W. HALLETT, Head, Department of Chemistry and Metallurgy
(S)	Sunderland Technical College	Dr E. P. HART, Head, Department of Chemistry and Biology
(EE)	Whitehaven College of Further Education	Mr W. P. THISTLETHWAITE, Head, Department of Chemistry
X.	WALES	
(E)	Cardiff, Welsh College of Advanced Technology	Mr A. H. HENSON, Head, Department of Chemistry and Biology
(T)	Connah's Quay, Flintshire Technical College	Mr S. MCLINTOCK, Head, Department of Chemistry and Metallurgy
(V)	*Neath Technical College	Mr T. B. WILLIAMS, Lecturer in Chemistry
(E)	Newport and Monmouthshire College of Technology	Mr L. MCGRAGHAN, Head, Department of Science
(V)	Swansea College of Technology	Mr M. J. COTTER, Lecturer in Chemistry
(E)	Treforest, Glamorgan College of Technology	Mr L. H. THOMAS, Head, Department of Chemistry and Chemical Engineering
(T)	Wrexham, Denbighshire Technical College	Dr E. W. CLAYDON, Head, Department of Science

SCOTLAND

(A)	Aberdeen, Robert Gordon's Technical College	Dr M. B. WATSON, Head, Department of Chemistry
(K)	*Coatbridge Technical College (Lanarkshire)	Dr J. STARK, Head, Department of Chemistry
(FF)	Dundee Technical College	Dr T. J. MORRISON, Head, Department of Chemistry
(J)	Edinburgh, Heriot-Watt College	Professor F. BELL, Head, Department of Chemistry
(K)	Paisley Technical College	Mr J. S. MCLEAN, Head, Department of Chemistry

NORTHERN IRELAND

(B)	Belfast, College of Technology	Dr D. HAMER, Head, Department of Chemistry and Pharmacy

The Manchester College of Science and Technology and the Royal College of Science and Technology, Glasgow, will continue to have Hon. Representatives, whose names appear in the following list.

HONORARY REPRESENTATIVES IN UNIVERSITIES

ABERDEEN, The University	Dr R. B. STRATHDEE, O.B.E., T.D., Reader in Chemistry
ABERYSTWYTH, University College of Wales	Mr J. B. BOWEN, Lecturer in Organic Chemistry
BANGOR, University College of North Wales	Dr W. R. ANGUS, Senior Lecturer in Physical Chemistry
BELFAST, The Queen's University	Professor C. L. WILSON, Professor of Analytical Chemistry
BIRMINGHAM, The University	Professor J. C. TATLOW, Professor of Organic Chemistry
BRISTOL, The University	Dr L. HOUGH, Lecturer in Chemistry
CAMBRIDGE, The University	Dr F. G. MANN, F.R.S., Reader in Organic Chemistry
CARDIFF, University College of South Wales and Monmouthshire	Dr N. M. CULLINANE, Senior Lecturer in Chemistry
DUNDEE, Queen's College (University of St Andrews)	Dr R. ROGER, Senior Lecturer in Chemistry
DURHAM, The Durham Colleges	Dr C. W. GIBBY, Lecturer in Chemistry
EDINBURGH, The University	Professor E. L. HIRST, C.B.E., F.R.S., Professor of Organic Chemistry
EXETER, The University	Dr K. SCHOFIELD, Reader in Organic Chemistry
GLASGOW, The University	Dr J. BELL, Senior Lecturer and Assistant Director of Chemical Laboratories
GLASGOW, The Royal College of Science and Technology	Mr H. G. A. ANDERSON, Lecturer in Inorganic Chemistry
HULL, The University	Dr B. J. HATHAWAY, Lecturer in Inorganic Chemistry
LEEDS, The University	Dr J. H. ROBERTSON, Lecturer in Inorganic and Structural Chemistry
LEICESTER, The University	Professor L. HUNTER, Professor and Head of Department of Chemistry
LIVERPOOL, The University	Dr A. HICKLING, Reader in Physical Chemistry
LONDON, Bedford College	Dr J. W. SMITH, Reader in Chemistry
LONDON, Birkbeck College	Dr D. J. G. IVES, Reader in Chemistry
LONDON, Imperial College	Dr G. J. HILLS, Lecturer in Physical Chemistry
LONDON, King's College	Professor D. H. HEY, F.R.S., Professor and Head of Department of Chemistry
LONDON, Queen Elizabeth College	Professor H. BURTON, Professor of Chemistry
LONDON, Queen Mary College	Dr Cecilie M. FRENCH, Lecturer in Chemistry
LONDON, Royal Holloway College	Dr T. G. BONNER, Lecturer in Chemistry
LONDON, University College	Dr A. G. DAVIES, Lecturer in Chemistry
MANCHESTER, The University	Dr G. N. BURKHARDT, Senior Lecturer in Chemistry, Senior Tutor to the Faculty of Science
MANCHESTER, The College of Science and Technology	Dr G. HOLT, Lecturer in Chemistry
NEWCASTLE UPON TYNE, King's College, University of Durham	Mr R. E. DODD, Lecturer in Chemistry
NOTTINGHAM, The University	Dr C. C. ADDISON, Reader in Inorganic Chemistry
OXFORD, The University	Dr H. M. IRVING, University Demonstrator in Inorganic Chemistry
READING, The University	Dr P. F. HOLT, Lecturer in Chemistry
ST ANDREWS, The University	Mr D. M. G. LLOYD, Lecturer in Chemistry
SHEFFIELD, The University	Professor R. D. HAWORTH, F.R.S., Firth Professor and Head of Department of Chemistry
SOUTHAMPTON, The University	Dr R. E. PARKER, Lecturer in Organic Chemistry
SWANSEA, University College	Dr H. E. HALLAM, Lecturer in Chemistry

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Radiation Hazards and Safety.—A four-week course on this subject will be held at the Middlesex Hospital Medical School, beginning on 24 October. It will consist of lectures, demonstrations and practical work designed to give an introduction to the subject, and will be suitable for chemists and other professional workers whose duties require an overall appreciation of the problems involved in maintaining radiological safety in the use of radiations and radioactive substances in industry and medicine. The fee for the course is £40, and application forms may be obtained from the Secretary, Department of Physics, Middlesex Hospital Medical School, London, W.1.

Lord Adams Research Fellowship.—This Fellowship is about to be established at King's College, Newcastle, by a group representative of industrial and other interests in West Cumberland. The Fellowships will be open to persons having connections with the County of Cumberland who, by publication or otherwise, have shown themselves able to carry out original research. The Fellowships will be awarded for research in any faculty and their normal tenure will be two years. The stipend for the first year will be £950 and for the second year £1,000. Awards will be made by the Council of King's College on the recommendation of the Academic Board.

Section Activities

ABERDEEN AND NORTH OF SCOTLAND

Washing Powders. On 21 January Mr L. N. Savidge of the Unilever Research Department gave a lecture on 'Synthetic Detergent Washing Powders' to a joint meeting held in the University Union.

Acetylenic Compounds. On 19 February members attended a Chemical Society Centenary Lecture by Professor N. A. Sørenson on 'Some Glimpses of the Changes which Nature makes in Acetylenic Compounds.'

Complexometric Methods. The last lecture of the year was given by Dr T. S. West, who spoke on 'Complexometric Methods of Analysis: Metals and Non-metals.'

The term complexometric titration was defined and the reagents involved were reviewed and discussed briefly. The reactivity of the complexans, as typified by ethylenediaminetetra-acetic acid (EDTA), towards cations in solution were enumerated and analogies were drawn between chelatometric and acid–base processes both with respect to titration curves and visual indicator action. The behaviour of a few indicators, together with a sensitive and highly selective colorimetric procedure for fluoride ion based on the use of the reagent Alizarin Complexan, was demonstrated to the audience. The lecturer next proceeded to discuss the enhancement of selectivity in complexometric titrimetry by use of masking agents and amalgam reduction. Attention was focused closely on the problem of the accurate titration of calcium in the presence of magnesium. A sensitive and highly selective metallochromic reagent for calcium, unaffected by barium and strontium, was demonstrated, and some implications behind its reactivity were discussed. Finally the lecturer surveyed recent work on the synthesis and properties of new complexan reagents and illustrated some unusual reactions which have recently been discovered in this field of work.

Annual General Meeting. The Section A.G.M. was held on 26 April, Mr D. W. Menzies being in the Chair. Dr H. Robertson was elected Chairman in succession to Mr D. W. Menzies, and Dr J. A. Lovern was elected to the position of Vice-Chairman. Dr P. N. Hobson was re-elected Hon. Secretary and Treasurer, and the two vacant places on the Committee were filled by Dr A. K. Lough and Dr K. C. B. Wilkie.

BELFAST AND DISTRICT

Annual General Meeting. The Annual General Meeting of the Section was held on 2 May, when the following Officers and Members of Committee were elected for the year 1960-61: Chairman, Professor C. Kemball; Vice-Chairman, Dr T. Caughey; Hon. Secretary, Dr R. J. Magee; Hon. Assistant Secretary, Mr I. W. Milligan; Hon. Treasurer, Dr M. Nelson; Members of Committee, Professor H. B. Henbest, Dr A. J. Howard and Messrs C. McDowell, M. Semple and F. Kirkpatrick (Member of Council, *ex officio*); Hon. Auditor, Mrs N. I. Bell, failing whom Dr H. K. Lawton.

The Section accepted with great regret the resignation of Dr W. Honneyman from the position of Hon. Treasurer, an office which he had held since 1926 with a break of only two years. Many tributes to his outstanding service were made by the members present.

HULL AND DISTRICT

Chemical Background to Colour Photography. The Annual General Meeting was held on 28 April and was followed by a Joint Meeting with the University of Hull Chemical Society. Dr G. I. P. Levenson (Kodak Ltd) lectured on the subject 'Chemical Background to Colour Photography', Mr G. Colman Green being in the Chair.

The lecturer began by reviewing briefly the elementary theory of colour and its implications in colour photography and then described the various methods of obtaining colour photographs. Basically the first step is to obtain silver negative images corresponding to the blue, green and red aspects of the original subject. Having secured these, the colour image can be reached by several paths. In *additive* systems the chemistry can be confined to producing three positive black-and-white silver images. These are used to modulate the blue, green and red illuminants provided by the various optical arrangements so that the three primary versions can be viewed simultaneously. In *subtractive* systems the blue, green and red impressions are converted to yellow, magenta and cyan colour images, respectively; these can be negative, or, by reversal processing, positive colour images. These colour images are viewed in register, each in succession acting as a modulator for a white illuminant; the simultaneous presence of all three colour images represents 'black.' Their presence in pairs will transmit the primary colours, *e.g.* magenta and cyan will transmit blue, whereas the absence of all three colour images gives the brightest white.

The colour images can be obtained by transfer of dye or pigmented gelatin or by colour destruction. The latter system depends upon the fact that certain azo dyes are decomposed in the presence of the finely-divided silver image by several reagents, *e.g.* acid thiourea. The colour images can also be reached by colour generation —the most important approach. The principal system depends on the formation of a suitable coloured dye when the silver image is developed by a paraphenylene-diamine-type developing agent in the presence of coupling agents. The couplers may be in solution or may be incorporated in non-wandering form in the emulsion layers of the film. The latter are most convenient for materials that are to be processed by the consumer.

Dr Levenson outlined the chemistry of the Kodachrome process and also the processing operation for

Eastman–Kodak film. He also described the methods of approach used to control a colour process on the industrial scale and to diagnose the cause of faults.

The lecture was very well illustrated by slides. The vote of thanks was proposed by Dr D. E. Webster and seconded by Dr L. G. H. Wyatt.

LIVERPOOL AND NORTH-WESTERN

Glass and the Periodic Table. At a meeting held on 24 March at St Helens Technical College, Dr A. Coussens, President of the Society of Glass Technology and formerly Technical Manager of Forster's Glass Company of St Helens, gave a lecture entitled 'Glass and the Periodic Table.' The chair was taken by Dr Helena Bradbury.

The research of O. Schott resulted in the first systematic production of new commercial glasses, and development has continued with the introduction of many further elements to give glasses with a widening range of physical and chemical properties.

The nature of the vitreous state was obscure, and X-ray analysis at first suggested the presence of dispersed crystallites. An alternative view that glass consisted of an extended three-dimensional network lacking overall periodicity gained support from the X-ray studies of B. E. Warren and for 20 years was widely accepted.

An increasing amount of evidence against this theory is now accumulating, from work including more precise X-ray techniques, studies based on colour and infra-red absorption, a thermal treatment of 'Albite' glass and use of the electron microscope.

An interesting modern glass 'Vycor' furnishes further evidence. This material is prepared from a special borosilicate glass which, when held at 500–600°, develops two intimately mixed phases in the solid, one almost pure silica, the other a borate glass. The latter is then leached out with dilute acid and the resultant porous skeleton, when heated at over 1000°, shrinks to give a normal non-porous glass containing 96 per cent of silica.

The degree of inhomogeneity of the parent glass is governed by the heat treatment, and E. A. Porai-Keshits and N. S. Andreyev found that its presence was shown by a low-angle X-ray scattering test only when inhomogeneity radii exceeded 100 Å. Their work suggests the failure, in previous uses of this test, to show inhomogeneities in other glasses.

The vote of thanks to the lecturer was proposed by Mr F. Hartley, Head Analyst of Pilkington Bros Ltd.

Annual General Meeting. The A.G.M. was held on 7 April in the Muspratt Lecture Theatre, Donnan Laboratories, University of Liverpool. About 60 members attended and the Chair was taken by Dr Helena Bradbury who announced the following Committee appointments for the forthcoming year: Chairman, Mr Edward Myer; Vice-Chairman, Mr G. H. Turner. Dr S. Paul and Messrs C. K. Boundy, P. Eaglesfield and C. N. Thompson retired from the Committee having completed three years' service and were replaced by Drs A. Crossley and R. O. Gibson, and Messrs B. Haynes and L. G. Townsend. Mr R. R. Appleby was re-elected Hon. Recorder.

Mr J. Ashley-Jones made known his wish to retire from the position of Hon. Secretary which he had occupied for the past 12 years. Dr Bradbury expressed sincere appreciation of all that Mr Ashley-Jones had done for the Section during his term of office, these sentiments being heartily endorsed by all those present. The appointment of a new Hon. Secretary and Hon. Assistant Secretary was, with the approval of the meeting, left over until the next meeting of the Committee, Mr Ashley-Jones having agreed to continue to act as Secretary in the meantime; he further agreed to continue to serve on the Committee to fill the vacancy caused by the elevation of Mr Turner to the office of Vice-Chairman (*see* below).

The Hon. Treasurer, Mr L. Wild, presented his report for the year and, after this had been approved by the meeting, Mr Wild was re-elected to that office. The two Hon. Auditors, Messrs L. V. Cocks and P. N. Williams, were also re-elected.

The vacant positions of Hon. Secretary and Hon. Assistant Secretary have now been filled by the appointment of Mr H. R. Jones and Mr B. Haynes, respectively; communications for both these gentlemen should be addressed to The Central College of Further Education, Carlett Park, Eastham, Wirral (Tele: Eastham 1369), where Mr Jones is Head of the Science Department and Mr Haynes is a Senior Lecturer.

Medicine's Debt to Chemistry. The Section was particularly honoured and fortunate in being able to hear a lecture from Lord Cohen of Birkenhead, Professor of Medicine in the University of Liverpool, Senior Physician at the Royal Infirmary, Liverpool, and a recently appointed Honorary Fellow of the Institute. An audience of about 400 members and guests attended, including a number of senior scholars from Liverpool Grammar Schools.

Lord Cohen traced the interdependence of medicine and chemistry from the Grecian period, *ca* B.C. 400, in the time of Hippocrates. He outlined the theories of Paracelsus who thought that the body contained three vital elements, sulphur, mercury and salt, and that disease was caused by imbalance of these factors and could therefore be treated by dosing with the deficient element; he also mentioned the 'Doctrine of Signatures,' in which the colour of the celandine was taken to indicate its usefulness in the treatment of jaundice, the shape of the leaf of the trefoil its relations with heart disease, and so on. A turning point in the relation between the two subjects was the conversion of ammonium cyanate to urea by Wöhler in 1828; more significant was his observation in 1841 that benzoic acid could be

conjugated with glycine in the body to form hippuric acid, a reaction which is used to the present day as a test of liver function.

Throughout the last century there has been comparable progress in both fields; chemistry has revealed many mechanisms of metabolism in the body and has played a very important part in the fields of pharmacy and pharmacology. In this latter sphere, chemists have isolated the active principles of many drugs and other substances such as vitamins and hormones; they have then been able to modify these active principles to enhance the desirable properties or to reduce or remove the undesirable ones, and they have improved methods of extracting these active principles or devised means of manufacturing them by synthetic methods.

Lord Cohen then went on to outline the advantages which have accrued to medicine as a result of these pharmacological advances. He illustrated the advantage of reduced bulk by comparing the half pound of raw liver previously eaten daily in the treatment of pernicious anaemia with the 20 μg of vitamin B_{12} now injected for the same purpose. The pharmacological action of any drug can only be ascertained quantitatively if the pure material is available, and when such results are available, it then becomes possible to modify the compounds, as has been done with the sulpha drugs, to make them more specific. Although it is now possible to make compounds with similar electronic structures to those of drugs already in use, which might be expected to have similar pharmacological properties, Lord Cohen emphasized that it is very difficult to assess the pharmacological action of a drug on the basis of its structure, and that biological tests on animals, and ultimately on man, must be used to ascertain their effects.

Lord Cohen then gave examples of the way in which microchemical analysis has led to great medical advances. Although it was established that deficiency in the secretion of insulin by the pancreas was the cause of sugar diabetes, insulin itself was thought to have a toxic effect until blood-sugar analysis showed that such injections could reduce the blood-sugar concentration below a critical level unless steps were taken to ensure a correct balance. Similarly accurate estimation of calcium in the blood has been of value in determining the function of the parathyroid gland.

Finally Lord Cohen outlined the various courses which the metabolism of phenylalanine and tyrosine could take and indicated how a number of serious disorders could arise when any of these courses was not followed normally.

A short discussion followed the lecture; the lecturer declined to predict the most likely developments in the near future, but expressed the hope that the chemistry of the cancer cell would become more fully understood so that the disease could be controlled by chemical means instead of by radiation techniques.

A vote of thanks to Lord Cohen was proposed by Professor R. A. Morton, F.R.S., who equated Lord Cohen's lecture as an Honorary Fellow to the Diploma picture which an artist is required to present to the Royal Academy on his election as an Associate.

Flash Photolysis and the Study of Fast Reactions. Professor G. Porter, F.R.S., gave a lecture under this title at the Birkenhead Technical College on 28 April.

Dr H. Bradbury presided and in introducing the lecturer mentioned his recent lecture tour in the U.S.A. and Western Germany.

Flash photolysis is a technique whereby the transient intermediates of rapid chemical reactions can be studied. In brief, the apparatus used is a quartz reaction vessel with a parallel photoflash lamp that gives an intense flash of light of only a few μ-sec duration. Reactants (gas or liquid) in the tube can be induced to react by absorbing energy from the flash.

In flash spectroscopy a second lamp known as the spectroflash is used. Electronically timed and beamed along the reaction tube, it allows absorption spectra of the reactants to be recorded at any required instant or at timed intervals.

Kinetic spectrophotometry is a method for studying the kinetics of reaction whereby a photocell and oscilloscope record intensity over a smaller wave-length interval.

The lecturer described some work with these methods on unstable free radicals, such as ClO, which led to the detection of new and transient types of absorption spectra, believed to be due to stable molecules, such as O_2, in vibrationally excited states. These molecules although at room temperatures are exceedingly hot vibrationally, owing to the retention of reaction energy.

Professor Porter showed how flash photolysis could be used in the investigation of triplet states. Recent work on the recombination of iodine atoms proved that this reaction involved an intermediate complex between an iodine atom and the third body.

More recently, the technique has been applied to solutions, particularly to transient intermediates of more complex organic reactions. One example given by the lecturer was the photochemical reaction of quinone, in which were observed two semiquinones and the triplet state of duroquinone.

After a brisk discussion Mr D. G. Cooper proposed the vote of thanks.

Retirement of Mr Ashley-Jones. J.A.J., as he is familiarly known to his colleagues, has recently resigned the Section secretaryship, which he has most capably held for the past dodecade. This tenure of office is a record for the Liverpool Section, a large and active one, and has seldom been surpassed by the smaller Sections.

Mr Ashley-Jones is employed by J. Bibby & Sons Ltd, where he is the senior Section Head in the Analytical Laboratory. Incidentally, this particular laboratory has

proved a good stable for our local secretaries as its Chief, Mr H. Weatherall, was his predecessor. Furthermore, delving into local history, we find that the first Liverpool Section secretary was the late Mr John Hanley of the same department.

J.A.J., during his long term of office, has seen many changes. He acted as godfather and guide at the christening of three new Sections, all off-shoots from the old Liverpool Section, namely (1) North Wales, (2) Cumberland, and (3) North Lancashire.

In his last year of office, he was most gratified to be the first Hon. Secretary of the Institute to serve under a woman chairman in the U.K.

The members of the Section and the committee have been very fortunate in having not only such an efficient and indefatigable secretary but also the perfect host and mentor at Institute functions. He knows practically everybody both locally and at Russell Square, and is always available to deal with inquiries in his characteristically genial manner.

We cannot let his resignation pass without this acknowledgement and thanks for his sterling services over such a long period, not only to his Section, but to the Institute as a whole. In this we include his wife, whose assistance, especially with the clerical work, has been most valuable to the Section.

We are pleased to note that J.A.J. will remain on the Section committee where his experience and guidance will be most helpful, especially for his successor, Mr H. R. Jones of Carlett Park.

E. MYER

LONDON

Protection of Salt-water Cooling Systems. A joint meeting with the S.E. Branch of the Institute of Petroleum was held at the Medway College of Technology, Chatham, on 3 March, when Mr F. Martin, vice-chairman of the I.P. Branch, took the Chair and introduced the lecturer, Mr E. D. Dolan.

The lecture, which was illustrated by slides, dealt with all parts of a large refinery water-cooling system, with the exception of the tubulars. Different parts of the system are subjected to different types of attack and require different protective methods. Account must also be taken of climatic and geographical conditions.

The lecture was followed by an interesting discussion. The Chairman himself proposed the vote of thanks to the speaker, and to the college authorities for providing the facilities.

High-temperature Reactions. A joint meeting with the Society of Chemical Industry was held on 16 March at University College, when Professor F. D. Richardson spoke on 'High-temperature Reactions involving Condensed Phases.'

He singled out for consideration reactions between molten metals and slags in the temperature range 1500–1800°C, a region with thermal energies of the order of 10 kcal/g-atom, well away from reactions at room temperature and also from those of very-high-temperature plasma.

Professor Richardson went on to describe the chemical nature of the two liquid phases. In molten metals, the solutes are dispersed on an atomic scale: one could not recognize dissolved compounds, such as Al_2O_3, but there was probably some clustering of one solute about another when the energies of interaction were great enough, *e.g.* an oxygen atom dissolved in iron containing aluminium would probably have a higher proportion of aluminium atoms in its first coordination shell than existed in the body of the melt. A molten slag, which consisted of a mixture of metal oxides with silica, alumina and phosphorus pentoxide, had a structure dominated by the silicon–oxygen tetrahedron. In the extreme case of silica each corner of a tetrahedron was shared with another; at the other extreme, all the corners of crystalline orthosilicate were free, and each one carried a negative charge, giving the ion SiO_4^{4-}. It is now considered that a whole range of silicate ions are present in liquid slags, together with free oxygen ions, the exact proportions depending on the amount of silica present and the proportions of different cations, *e.g.* Ca^{2+}, Fe^{2+} and Mn^{2+}.

The lecturer then discussed the kinetics of reactions occurring between slag and metal. Such reactions are of special use in steelmaking where they are responsible for the elimination from the metal of carbon, phosphorus, silicon, manganese and sulphur. From elementary kinetic reasoning, it appears that if the rates of slag–metal reactions were controlled by chemical kinetics, they would be 10^2 to 10^4 times faster than found in practice. Thus the rates must be controlled by the speeds at which the combined processes of convection and diffusion can deliver reactants to the interface and remove products from it. For this condition the rates depend on the extent to which the two-phase system is out of equilibrium, the interfacial area and the transfer coefficients in slag and metal. These last are dependent on viscosity, diffusion coefficient, stirring rate and the equilibrium partition coefficient. In some conditions, transfer in the slag, and in others, transfer in the metal, could be rate-controlling.

Professor Richardson described a number of laboratory experiments designed to explore these problems. A study of the movement of sulphur shows stoichiometric relationship with the movement of silicon and iron from metal to slag and the disappearance of carbon from the metal. There are no less than four possible ways in which sulphur can transfer chemically from metal to slag. All but one are probably electrochemical, and this seems to be confirmed by a study of the movement of sulphur in the system silver – calcium borate: in this case e.m.fs can be measured and the reactions can be brought nearly to a standstill by an opposed e.m.f.

Film Show. A Film Show was held at the N.W. Kent College of Technology, Dartford, on 31 March, when Mr J. R. Barr took the Chair. The three films shown, namely 'Pattern for Progress,' 'Emulsions' and 'The Nature of Plastics,' were much enjoyed.

Formation of Cambridge Sub-Section. On 31 March about fifty members, including the Section Officers, met at the Technological Research Station of Spillers Ltd, Cambridge. Mr Hymas took the Chair at the meeting, which had been called to discuss the possibility of forming a Sub-Section to provide more activities in Cambridgeshire and neighbourhood.

Mr Hymas welcomed the idea, and details of the response to a circular sent to members in the area showed that nearly two-thirds of local members had replied, all approving the venture. Of these, over seventy had promised to attend meetings. Discussion showed that members would appreciate a programme of about six meetings a year based, for the first year, on Cambridge.

It was proposed by Mr C. F. Hadley, seconded by Dr A. J. Duke, that a Sub-Section be formed; this was carried unanimously. The following were elected to the Sub-Section Committee: Chairman, Dr J. Williams; Hon. Secretary, Mr C. F. Hadley; Committee Members, Mr G. E. Boynton, Dr A. J. Duke, Mr J. F. Harris and Dr F. G. Mann, F.R.S.

Mr Hymas thanked all concerned with the meeting, especially Dr P. W. Russell Eggitt and the Directors of Spillers Ltd, for making the Research Station available.

After refreshments, the meeting finished with a short film show.

Laundering Modern Fabrics. The Section's fourth Ladies' Evening was held at the Royal Institution on 25 April, when a lecture on 'Laundering Modern Fabrics,' and a survey of the activities of the British Launderers Research Association, were given by Mr F. R. Hill and Mr J. Leicester. Mr Hymas was Chairman.

Mr Hill considered the problems which beset housewives and launderers through the introduction and general use of fabrics derived from man-made fibres and from traditional fibres with special finishes.

With fabrics of man-made fibres, various undesirable effects such as softening, physical breakdown and deformation, and discoloration can take place through overheating in the laundering process. Articles made from nylon or Terylene attract dirt electrostatically and become heavily soiled. Chemical treatments partly overcome this trouble.

When fabrics made from the traditional fibres are improved in one property (such as crease- or flame-resistance, by the application of special resin or other finishes) they generally suffer in another. Resistance to abrasion and tearing is sometimes reduced with minimum iron finishes, some of which may also retain active chlorine from bleach used in washing; breakdown of the resin chlorine compound during subsequent ironing causes discoloration and weakening of the fabric.

In dry-cleaning perchloroethylene is commonly used. Since this solvent can selectively remove dyes from pigment-printed fabrics, it is not universally applicable. Several articles of misshapen and discoloured clothing were shown to illustrate the sensitiveness of some modern fabrics to various laundering treatments.

Mr Leicester listed the Divisions of the B.L.R.A. and described their functions. He pointed out the advantages of a continuous laundering process and reported the efforts of his Association to make it a reality.

After an interesting discussion, in which many ladies took part, Mrs Hymas proposed the vote of thanks.

Organic Syntheses with Peroxidase. At a well attended meeting at the Luton College of Further Education on 7 April, Dr B. C. Saunders was the lecturer. As the substance of his lecture has already been reported (*Lect. R. Inst. Chem.*, 1957, No. 1) it is not necessary to reproduce it here.

MID-SOUTHERN COUNTIES

Disposal of Industrial Wastes. A Symposium was held jointly with the Fawley Branch of the Institute of Petroleum at the Esso Refinery, Fawley, on 2 April. Five papers were presented, two of them dealing with the problem generally, the others with specific industries or problems.

The morning session was presided over by Dr F. Mayo, Chairman of the Fawley Branch of the Institute of Petroleum and in the afternoon Dr N. Wright, Chairman of the Section, presided.

In his introductory remarks Dr Mayo said that the question of disposal of industrial wastes was very important, although this was not something of which the authorities and industry had just become aware. This problem had existed for a long time but had become accentuated since the war with the rapid growth of industry and the growing realization of the limitations of our countryside. Those in industry had a great responsibility to see to it that good land, water and air were kept as clean and wholesome as possible. This was a responsibility which industry readily accepted, and to that extent this Symposium would be of great help in discussing some of the problems encountered.

In the first paper, a general one, the problem was reviewed on a national basis by Mr F. E. Ireland, Deputy Chief Alkali Inspector. The complex nature of the problems of disposal and their side-effects was discussed, and it was shown that it is not simply a matter of putting solids, liquids and gases respectively into the three great 'sinks,' the land, the sea and the air. Mr Ireland gave examples of unexpected results where disposal in one phase had led to pollution in another and discussed ways around these problems. The major pollution problems common to a number of larger

industries, including power stations, iron and steel works, cement works and oil refineries, were discussed.

The second paper was read by Mr A. B. Wheatland of the Water Pollution Research Laboratories and was entitled 'Treatment of Industrial Effluents.'

Mr Wheatland said that any pollution of our rivers must be a matter for concern. In many areas, rivers must serve as a source of water for domestic and industrial purposes and also as a means of disposal of the water after use. In considering the steps necessary to prevent pollution by industrial effluents, it is important to consider first the processes from which the waste waters originate, to determine whether the volume and strength of the wastes can be reduced, and whether after suitable treatment any water can be re-used. This can often greatly reduce the size of treatment plant required, and in favourable cases recovery of products may partly or wholly offset the cost of treatment. The processes used in the treatment of industrial effluents may be primarily physical, biochemical (including aerobic and anaerobic processes) or chemical, but generally a combination of two or more processes is involved. The chief processes were discussed with reference to metal-finishing wastes, organic wastes of natural origin, organic wastes from chemical industries, and oil emulsions.

The third paper was presented by Dr D. G. Turpin of the Esso Laboratory at Fawley, and entitled 'Oil Refinery Waste Disposal Problems.'

Dr Turpin said that it was now standard practice in the U.K. for waste disposal and anti-pollution facilities to be built in a refinery as an integral part of the design. The greatest disposal problems were encountered with oil-contaminated cooling water, malodorous spent caustic soda, water bearing hydrogen sulphide, and noxious or offensive gases. In his paper, Dr Turpin described the facilities at Fawley refinery for dealing with these problems and produced some interesting statistics indicating the magnitude of the problem associated with the operation of such a large refinery.

The fourth paper was presented by Mr G. J. C. Nash, Senior Industrial Chemist of the Atomic Energy Authority Establishment, Winfrith Heath. This paper was entitled 'The Disposal of Radioactive Wastes.'

To indicate the magnitude of the problem Mr Nash said that by 1965, in the U.K. alone, the production of 6,000 MW of electrical power by nuclear fission will produce 6 to 8 tons of long-term fission products per annum with a radioactivity of 10^9 curies. Continuous production at this level would result in an equilibrium value of 3×10^9 curies being reached in something over 100 years.

It has been calculated that 10^9 curies would need to be diluted with 10^6 cubic miles of sea-water (0·3 per cent of the total volume of the oceans of the world) in order to dilute the concentration of fission products down to the levels permitted in drinking water. By A.D. 2000 the global figure for atomic power is expected to reach 50–100 times the 1965 target for the U.K., a yearly production of up to 10^{11} curies. It is therefore evident that if man is to protect himself and his habitat, careful control over the disposal of wastes will have to be exercised.

In addition to this major source of fission products there are other contributors, such as research centres, hospitals and industry. Although these users of radio-isotopes make a small contribution to the magnitude of the problem their siting was rarely ideal and special administrative arrangements have to be made. Mr Nash went on to review the methods which were in use and being developed to ensure that this problem was kept under proper control.

The concluding paper was presented by Mr A. W. W. Kirby of Shell Refining Company and entitled 'Pollution Abatement and the Amenities of the Countryside.'

Mr Kirby dealt with the problem of SO_2 emission and the investigations which had been carried out at one of the Shell refineries in this country to establish the effects of SO_2 on crops. The cooperation of a number of organizations, including the National Farmers Union, the Ministry of Agriculture, Fisheries and Food and the Department of Botany, University of Manchester, had been obtained. As a result of the investigation over a number of years, which included the planting of control crops, it had been possible to define the problem and take remedial action, which had proved to be very effective.

Mr Kirby then turned to the pollution of waters and referred briefly to the various Acts.

Speaking about the Clean Air Act, Mr Kirby thought that anomalies might arise because of the, at times, conflicting heights of chimney stacks required by the local authorities and the Alkali Inspectorate.

Dr Wright closed the Symposium with an expression of thanks to the contributors, the host Company and all those who had worked behind the scenes.

Works Visit and Lecture. On 26 April a visit was made to British Drug Houses Ltd at Poole. After an excellent lunch—the Company being host—members were taken on a highly successful conducted visit.

In the evening a lecture on 'Lubrication,' illustrated with films, was given by Mr J. E. James of Snowdrift Lubricants Ltd, assisted by Mr J. H. Taylor. It was arranged jointly with the Poole Technical Group.

Annual General Meeting. On 14 May the A.G.M. was held at Poole. Members and their wives met for lunch at the Antelope Hotel, Poole, after which the business meeting took place at British Drug Houses Ltd. The following Officers were elected: Chairman, Mr D. H. Bell; Vice-Chairman, Dr G. T. Ball; Hon. Treasurer, Mr R. W. Watridge; Hon. Secretary, Mr T. F. McCombie; Hon. Recorder, Mr S. L. Kidman. The following were elected Members of Committee:

Dr P. Bosworth and Messrs A. G. Hill, G. Nash and W. Thorne.

Members and guests reassembled for tea, after which a fascinating lecture 'Diatoms—Jewels of the Plant World' was given by Mr N. I. Hendey, Senior Microbiologist at the Admiralty Materials Laboratory, Holton Heath.

NORTH LANCASHIRE

Report on the Sixth Annual General Meeting. The sixth A.G.M. was held on 31 March in the Technical College, Blackburn. Mr C. D. Lafferty was in the Chair. The reports of the Hon. Secretary and the Hon. Treasurer and the audited statement of accounts for the year 1958–59 were adopted.

The retiring Chairman then introduced his successor, Mr T. E. V. Horsley. Mr E. Rogers was re-elected Hon. Treasurer for a further period of one year. Three vacancies on the Committee for Ordinary Members were filled by Messrs S. Hargreaves, M. Hayes and Dr S. Skidmore. Messrs W. G. Creasy and E. F. D. Winter, retiring Ordinary Members of Committee, were elected Hon. Auditors for the coming year.

The A.G.M. was preceded by a lecture on 'Wines' given by Mr G. Osgood, which will be printed shortly.

Mr A. N. Edmondson gave a hearty vote of thanks to the lecturer for a most interesting and entertaining talk and for a very successful wine-tasting session.

Works Visit. On 29 April a party of 30 members and their friends visited the new Kitt Green factory of Messrs J. Heinz Ltd and they were received by the manager and escorted on a most interesting tour of the works and the laboratories. Afterwards they were the guests of the management at tea.

Mr W. G. Creasy proposed the vote of thanks to the management and staff.

NORTH WALES

Intermetallic Chemistry. A joint meeting with the North Wales Metallurgical Society was held at the Flintshire Technical College, Connah's Quay, on 27 April. An enthusiastic audience was addressed by Professor W. Hume-Rothery, O.B.E., F.R.S., on 'Intermetallic Chemistry.' The lecturer described the relation between the forces involved in chemical combination, and those existing between the atoms in metals and alloys. He showed how the polar or ionic bonds present in salts extended into compounds such as MgTe, Mg_2Sn and Mg_2Pb. Covalent bonds, such as those present in the crystal of the diamond, also existed in compounds such as GaAs and ZnSe, some of which were of great interest as semi-conductors. He then reviewed the main classes of phases found in alloy systems, including primary or terminal solid solutions, and intermediate phases of fixed or variable composition. He showed that in some compounds the structures could be regarded as determined by three main factors: the 'size-factor' (*i.e.* the percentage difference between the atomic diameters of the atoms), the electrochemical factor, and the electron concentration, or ratio of valency electrons to atoms. By choosing suitable examples, the effect of one factor alone could be isolated and studied. In general, all three factors, together with others not yet understood, were involved, and it was for this reason that the structures of metals and alloys appeared complicated.

The Section Chairman presided, and Mr H. Edwards, Chairman of the North Wales Metallurgical Society, proposed the vote of thanks.

SOUTH WALES

Annual General Meeting. The 42nd A.G.M. of the Section was held on 27 May at the Mond Nickel Co. Ltd, Clydach, Swansea. Before beginning the formal business of the meeting, the Chairman, Mr R. H. Jones, paid tribute to the memory of Mr E. E. Ayling, Hon. Secretary of the Section from 1939 until his sudden death in March. The meeting stood for a minute in silence in memory of a colleague who had served the Section with such devotion.

The following Officers and Members of Committee were elected for 1960–61: Chairman, Mr R. H. Jones; Hon. Secretary-Treasurer, Dr H. E. Hallam; Members of Committee, Miss E. Leyshon, Messrs B. W. Bryant, W. R. Davies, P. F. Ellis, M.B.E., H. Evans and D. J. D. Unwin. Reports of the Section's activities and finances were given by the Hon. Secretary and of Institute activities as a whole by Mr S. J. H. O. Chard, District Member of Council.

Before the meeting members spent a most enjoyable afternoon touring the Nickel Refinery, after which they were entertained to tea. At the end of the proceedings Dr Islwyn Jones proposed a vote of thanks to Dr A. G. Ramsay, Resident Director of the Mond Nickel Co., for the hospitality shown.

CEYLON

Enzymes and Cancer. At a joint meeting with the Chemical Society of Ceylon held at the University Chemistry Lecture Theatre, Colombo, on 19 November, 1959, Dr K. A. Jegatheesan, Biochemist, General Hospital, Colombo, gave a talk on 'Acid Phosphatase and Glycolytic Enzymes in Cancer.'

After outlining some of the earlier work on these enzymes the speaker proceeded to more recent developments. He stated that the use of inhibitors such as alcohol, formaldehyde and tartrate had led to a certain measure of differentiation as to the tissue source of origin of acid phosphatase. Such differential inhibition also pointed to the existence of different types of acid phosphatases. Red cell acid phosphatase is completely destroyed by formaldehyde, though the prostatic enzyme is unaffected; the reverse holds true with tartrate. The acid phosphatase of other tissues exhibited varying degrees of inhibition with formaldehyde and tartrate.

Dr Jegatheesan mentioned that tartrate inhibition of prostatic acid phosphatase was one of the few instances known where an inhibitor showed stereospecific properties towards an enzyme. He also stated that this inhibitor in its various optical forms was being used in the study of the structure of the acid phosphatase molecule.

The speaker then considered the application of these inhibitors in clinical work. He stated that the serum total and formol-stable acid phosphatase activities in metastatic breast cancer quite often approached those found in prostatic cancer. However, the serum tartrate–labile acid phosphatase activity in these cases as well as in other non-prostatic cancer and in non-cancerous diseases was generally always within normal limits. He stated that the tartrate technique was more sensitive in detecting early prostatic cancer before the development of secondaries than either total or formol-stable acid phosphatase activity determinations.

Dr Jegatheesan then mentioned that differential centrifugation and inhibition studies carried out on bone secondary deposits in breast cancer had indicated that the increased serum acid phosphatase activity in breast cancer originated from metastatic nuclei in contrast to prostatic cancer where the enzyme seemed to be that of the cytoplasm.

Dr Jegatheesan said that the glycolytic enzymes have not quite fulfilled the hope that Warburg and Christian had raised in their study of tumours, namely as a diagnostic index in cancer. These enzymes in serum are elevated in an appreciable percentage of non-cancerous diseases as compared to cancerous; as such it appeared that the elevation was due more to cell impairment and necrosis rather than to extra glycolytic activity of the tumour cells themselves. In breast cancer cases, serum phosphoglucose isomerase was elevated in a greater percentage of cases than phosphoglycomutase, aldolase or lactic dehydrogenase; mutase was the least sensitive.

Dr Jegatheesan also stated that in breast cancer a good correlation has been shown between serum enzyme levels (total and formol-stable acid phosphatases and of the glycolytic enzymes, phosphoglucose isomerase) and progress of patient with therapy, *e.g.* hypophysectomy.

The speaker concluded that though the glycolytic enzymes could not be used as a diagnostic index, some of them, particularly phosphoglucose isomerase, have proved to be a very valuable index in following progress and prognosis, in certain respects even superior to radiology and other known parameters, especially in metastases of soft tissues like liver.

Dr Sultan Bawa, proposed the vote of thanks.

Amino Acids and Fusel Oil. A joint meeting with the Chemical Society of Ceylon was held on 3 March at the University of Ceylon, Colombo, when Dr S. Sentheshanmuganathan of the Medical Research Institute, Colombo, gave a talk on 'The Mechanism of Formation of Higher Alcohols from Amino Acids by *Saccharomyces cerevisiae*.'

He dealt in detail with the mechanism of fusel oil formation by the yeast *S. cerevisiae* with special reference to the formation of tyrosol from tyrosine. He showed that the first step is a transamination betweeen the amino acid and the α-ketoglutarate, giving rise to the corresponding keto-acid and the glutamate. The keto-acid that is formed is then decarboxylated by the yeast carboxylase with the formation of the aldehyde and carbon dioxide. The aldehyde is then reduced to the alcohol with DPNH as the hydrogen donor and with the aid of the enzyme, alcohol dehydrogenase. He also discussed the function of glucose in the process.

Natural Rubber Latex. At a joint meeting with the Chemical Society of Ceylon held on 6 May in the University of Ceylon Chemistry Lecture Theatre, Mr M. Nadarajah, Chemist at the Rubber Research Institute, Agalawatte, Ceylon, delivered a lecture on 'The Non-Rubber Constituents of Natural Rubber Latex.' Dr E. Rathenasinkam was in the Chair.

Mr Nadarajah said that every year about 70 million gallons of latex drip from Ceylon's rubber trees and the variability of the rubber produced depends chiefly on the non-rubber constituents of the latex. Field latex is a weakly hydrophobic sol and the particles in it are believed to be stabilized by proteins of which Hevein and α-globulin have been isolated and by the lipids of which α-lecithin is the chief component. Ammoniated latex is believed to be stabilized by the fatty acids which are formed by the hydrolysis of the lipids. The yellow pigment present in field latex is due to β-carotene and this is bleached by xylyl mercaptan in the rubber factories to produce a white crepe. Quebrachitol is the chief carbohydrate present in rubber latex and in the absence of a suitable use for it will go to waste in the rubber serum. Since latex serum contains a wide variety of amino acids, carbohydrates, proteins and various plant-growth factors the millions of gallons of latex sera wasted should be available for the large-scale production of antibiotics and growth factors. Calcium, magnesium and iron are the metals present in field latex, and copper and manganese are present as trace elements. Rubber producers are always on the alert to see that the minimum specifications for copper and manganese, especially that of copper, are not exceeded, as they can adversely affect the ageing properties of the rubber produced.

Many members joined in the discussion, and the vote of thanks was proposed by the Chairman.

Research Fellowships. The report of the Committee for 1959 stressed the lack of Research Fellowships at the University of Ceylon, which had been causing concern to the Section. The Committee had therefore approached the larger business enterprises operating in Ceylon for

assistance. As a result, the Shell Company of Ceylon offered a Fellowship in Applied Chemistry tenable at the University of Ceylon for three years, in the first instance. The annual value of the Fellowship is Rs. 4,200/–. The Section is grateful for this offer and hopes for others.

DECCAN

Radio-isotopes and their Applications. At a meeting held on 29 April in the General Chemistry Lecture Hall of the Indian Institute of Science, Bangalore, Dr C. C. Patel, assistant professor of inorganic chemistry at the Indian Institute of Science, gave a lecture on 'Radio-isotopes and their Applications.' Professor P. S. Sarma presided.

Dr Patel first reviewed the historical aspects of radio-isotopes, their early applications in radiotherapy and chemical kinetics. He then discussed the modes of nuclear disintegration and their origin, and pointed out the fundamental differences in the nuclear and chemical reactions. He gave an account of the production of radio-isotopes in particle accelerators and in uranium piles, emphasizing the importance of fission of ^{235}U and its fission products as a source of long-lived isotopes like ^{137}Cs and ^{99}Te, useful in research and industry.

In considering the effect of the masses of isotopes in chemical kinetics, Dr Patel pointed out that because of the high activation energy, reduced collision frequency and less stretching of the bond on activation, normally heavier radio-isotopic molecules, which are employed as tracers, would react more slowly than similar molecules with stable isotopes. The magnitude of the mass effect would be greater in the isotopes of the lighter elements than in those of the heavier elements, since the mass difference per unit atomic mass in the stable and radio-isotopes of the lighter elements is greater.

After dealing with the more theoretical aspects of radiation chemistry, the lecturer went on to say that in some of the complex organic molecules the nuclear radiations had a highly selective reaction as in the selective hydroxylation of a double bond in cholesterol and the oxidation of the end $-CH_2OH$ groups in mannitol. In the radiation-induced polymerization of hydrocarbon molecules, the final product depended on the duration of irradiation and the solvent. Ethylene dissolved in CCl_4 yielded polymers of the type $Cl(C_2H_4)_nCCl_3$ whereas in methyl alcohol or acetone it gave polyethylene. The polymerization was many times faster in the latter solvents than in the gaseous phase.

Dr Patel then explained the biological synthesis of amino acids labelled with ^{14}C, using the common green alga *Chlorella vulgaris*. He indicated the use of nuclear radiation in the preservation of vegetables. Finally, he described the theory and production of a small current by the use of ^{90}Sr in combination with a semi-conductor.

Vegetable Protein Foods. On 9 May a meeting was held in the General Chemistry Lecture Hall of the Indian Institute of Science, Bangalore, when Dr M. Swaminathan, assistant director in charge of the division of dietetics in the Central Food Technological Research Institute at Mysore spoke on 'Processed Protein Foods of Vegetable Origin.' Professor P. S. Sarma was in the Chair.

In introducing the subject Dr Swaminathan emphasized that protective foods like milk, eggs, fish and meat are not available in India and that consequently there is an urgent need for developing nutritious food supplements based on other protein-rich foodstuffs of vegetable origin and fortified with vitamins and minerals. The important protein-rich vegetable foods available in the country are the various oilseed meals such as groundnut meal, coconut meal, sesame meal and pulses like Bengal gram.

The speaker said that conditions were standardized for the production of supplementary foods based on blends of groundnut flour, Bengal gram flour and coconut meal and fortified with vitamins and calcium. A process was also developed for the preparation of nutritionally balanced malt food based on blends of cereal malt, low-fat groundnut flour and Bengal gram flour and fortified with vitamins and calcium. The nutritive value of the different foods was assessed by experiments on albino rats. The different foods, when incorporated at 12·5 per cent level in poor Indian diets, had a marked supplementary value to the diets, as indicated by the growth of rats.

The results of the study of the supplementary value of these foods to the diets of school children showed that supplementation of the diets with 2 ounces of the foods daily over a period of six months brought about a marked improvement in the growth and nutritional status of the children. Metabolic studies showed that the children receiving the protein supplement retained significantly more nitrogen, calcium and phosphorus.

The supplementary value of a protein food containing low-fat groundnut flour (60 parts), Bengal gram flour (20 parts) and skim milk powder (20 parts) and fortified with vitamin A, D, riboflavin and calcium phosphate to the diets of weaned infants was also studied. The results showed that supplementation of the diets with 2 ounces of the protein food daily over a period of nine months brought about a highly significant increase in the growth and nutritional status of the experimental group of children as compared with the control group. This food was also found to be quite effective in the treatment of protein malnutrition in children.

At the end of the lecture Dr Swaminathan exhibited a few samples of the processed food materials. Earlier, at tea just before the lecture, he had sent round a sample of sweets made out of 'multi-purpose food' processed from vegetable proteins.

There was a lively discussion, after which Dr S. C. Pillai proposed the vote of thanks.

News and Notes

COURSES AND AWARDS

Associateship of Woolwich Polytechnic.—The Governing Body of the Woolwich Polytechnic instituted the Associateship in the academic year 1958–59. Students who have successfully completed the examinations of the various bodies and institutions for which they are prepared at the Polytechnic are eligible for the award. Included in the latest list of Associates are students who have been awarded Diplomas in Technology.

The first Ceremony of Presentation took place on the evening of 31 May, when Sir Thomas Spencer presented the parchments. Afterwards a buffet supper took place, providing an opportunity for re-union between students, staff, guests and governors.

Awards for Youth.—Sir Alexander Fleck, former Chairman of Imperial Chemical Industries Ltd, has set aside a sum of money for the provision of four prizes to be presented annually to selected employees of the company who are under 21. Details of the scheme have not yet been worked out but it is understood that Works Councils and Staff Committees will in some way be associated with the selection.

MEETINGS AND CONFERENCES

Atomic Absorption Spectroscopy.—A symposium on 'Atomic Absorption Spectroscopy as an Analytical Technique' was held in the Department of Chemistry of the University College of Rhodesia and Nyasaland on 24 June. The subject was introduced by Mr A. J. Eve, *Associate*. This symposium was the first of a proposed series on subjects of interest to analytical chemists, under the auspices of the Chemical Society, London, and the Royal Institute of Chemistry. Further information on the symposia may be obtained from Professor S. H. Harper, *Fellow*, The Department of Chemistry, University College of Rhodesia and Nyasaland, Private Bag 167H, Salisbury, Southern Rhodesia.

National Society for Clean Air.—The Annual Conference and Exhibition of the Society will be held at Harrogate on 5–7 October. At the Conference an address will be given by Sir Keith Joseph, M.P., Parliamentary Secretary to the Minister of Housing and Local Government, the Presidential Address by Sir Hugh Beaver, K.B.E., and the Des Voeux Memorial Lecture by Sir Linton Andrews. The Exhibition, the largest and most comprehensive on the subject yet organized, will be of considerable practical value and interest to delegates. Details of the Conference arrangements will be included in the complete programme to be issued in August. There is a non-returnable registration fee of 3 guineas. Registration forms, which should be returned not later than 15 August, and further information may be obtained from the Director, Palace Chambers, Bridge Street, London, S.W.1.

Symposium on Redox Processes.—A Symposium on Redox Processes, with international participation, will be held in the Chemical Laboratories, University of Allahabad, under the auspices of the Chemical Research Committee, Council of Scientific and Industrial Research, India, in the third week of January, 1961. The exact dates will be notified later. Papers from those working in the subject are invited. Those interested should write to Mr Satya Prakash, Convener, Department of Chemistry, University of Allahabad, Allahabad, India.

Achema, 1961.—The European Convention of Chemical Engineering, including ACHEMA, 1961, 13th Chemical Engineering Exhibition-Congress, will take place at Frankfurt am Main between 9 and 17 June, 1961. The object of the Convention is to give professional people in this wide field a complete survey, at reasonably long intervals (the last Convention was in 1958), of the position and progress achieved in chemical engineering. The Gesellschaft Deutscher Chemiker will hold a special meeting on 14 July, at which attention will be called to the research work of distinguished scientists. This will be followed by four lectures in which specialist research workers will review the most recent developments in the various branches of chemistry. Provisional registration forms and further information may be obtained from DECHEMA, Rheingau-Allee 25, Frankfurt (Main) 7, Germany.

'WITH CARE'—A CHEMICAL APPROACH

There has been a welcome up-surge in the attention paid to safety in the chemical industry since the war —the more welcome because it has arisen within the industry without external pressure. The work of the Marking Containers Committee of the Association of British Chemical Manufacturers is an outstanding example of this.

Containers of bulk quantities of hazardous chemicals now bear prominent labels stating clearly for the uninitiated the degree and nature of the hazards involved, handling precautions and action to be taken in the event of an accident. Special arrangements are made for small quantities of chemicals, such as laboratory reagents.

The thought that has gone into the design of these admirable labels and the work of collecting reliable information about the increasing number of chemicals whose containers they adorn was described in lively fashion by Mr W. W. Diggle, Secretary of the A.B.C.M. Committee, in the paper bearing the above title which he presented at the National Industrial Safety Conference held in Scarborough in May. The paper is being printed in full in the Proceedings of the Conference by the

organizing body, that great advocate of safe working and living, the Royal Society for the Prevention of Accidents.

It is encouraging evidence that, as Mr Diggle says, 'in quite undemonstrative ways such as this, industry spends quite a lot of time, trouble and money trying to do the right thing, the safe thing, because it is the neighbourly thing to do'.

G. D. MUIR

THE ADVANCEMENT OF SCIENCE

When the British Association was started in 1831, its primary purpose was to persuade influential people in the community that science could usefully be applied to everyday affairs and that its cultivation was a worthwhile occupation. Today, 130 years later, there is no need to persuade the Government of the usefulness of science. It is now an article of faith that by training more and more chemists and physicists and biologists all the practical problems of wealth, security and happiness will be solved. Unfortunately, although dramatic advances in science have occurred, scientists have lost the ability to communicate their ideas to the ordinary educated non-scientists with whom they live. They have, indeed, largely lost the ability to communicate with each other.

To try to deal with at least a part of this problem of incomprehensibility, the British Association has now changed the appearance of its rather sombre, government-white-paperish quarterly into a more attractively set out bi-monthly journal. It contains, as before, a selection of the communications given at B.A. meetings but there are now notes and comments on various scientific topics and some book reviews as well. Whether this degree of amelioration of the rigours of reading a dossier of lectures, however clear and well informed, will tempt the 'students, upper form pupils of schools and laymen' to read them, or whether indeed such material without special editing can ever constitute the substance of a viable periodical journal, the future will decide.

MAGNUS PYKE

CARLETT PARK CHEMICAL AND PHYSICAL SOCIETY

In its 1959–60 session the Chemical and Physical Society of Carlett Park College of Further Education was honoured by the attendance of the President of the Institute, Mr E. Le Q. Herbert, who was the principal guest at the Society's fourth Annual Dinner. The President responded to the toast of the Institute which was proposed by Mr J. A. Adams, Student Chairman of the Society. Other speakers were Professor C. E. H. Bawn, C.B.E., F.R.S., who proposed and Mr P. J. Swain, a vice-president and past student chairman, who replied to the toast of the Society. Mr H. R. Jones, Head of the Science Department of the College, proposed and Mr A. G. Jones, Chairman of the Liverpool Section of the Society of Chemical Industry, responded to the toast of the guests. Some 70 members and guests attended the function.

The 1959–60 programme has included lectures by Dr W. B. Whalley (University of Liverpool) on Stereochemistry, Dr J. Haslam (I.C.I.) on Analytical Chemistry, Mr J. E. Such (Albright and Wilson) on Phosphorus Chemistry and a most stimulating and colourful discourse by Professor M. Stacey, F.R.S., on Science in the U.S.A. and the U.S.S.R. As in past years several meetings have also been devoted to papers read by student members.

The Society's second Ladies' Evening attracted over 200 members and guests and was devoted to 'Hair Condition and Beauty—Theory and Practice.' A lecture by Mr J. B. Wilkinson of Unilever Ltd Toilet Preparations Development Unit was followed by a delightful set of demonstrations of hairdressing techniques by his colleagues, for whom lady members of the Society acted as models. On this occasion the Chair was taken appropriately by the lady vice-chairman of the Society, Miss Della Hanley.

In addition to the usual programme of works visits, several social functions have been held. Notable among them was a week-end in October last, which over 60 members and friends spent in Snowdonia. The party was blessed with two days of unbroken sunshine which were spent on the mountains and a very pleasant evening in the company of Mr Showell Styles, the climber and author, who gave a delightful lantern lecture on his climbing experiences in North Wales.

INDUSTRIAL TRAINING PERIODS IN DIP. TECH. COURSES

More than 30 representatives of firms and organizations attended a conference on 11 May at the Northampton College of Advanced Technology, London, to discuss primarily matters concerned with the industrial training periods in the Dip. Tech. course in Industrial Chemistry which has now been in operation for two years.

The Departmental organization for dealing with the industrial training periods in the course was outlined by Dr J. Leicester, Head of the Department of Applied Chemistry. The Departmental staff are attached to individual factories or firms so that a personal relationship may be established between industry and the college. Each industrial establishment is visited at least twice during a training period, and a report is made on each visit. These reports, which are available on request to the particular firm concerned, comment on all aspects of training, and at the end of the course they form a basis for the assessment of the industrial training. How such assessments could be integrated into the final results of the Dip. Tech. was not, however, very clear. This point gave rise to much discussion and is a matter that should receive further attention.

The Dip. Tech. course in industrial chemistry at Northampton College is intentionally broad in scope and non-specialized in character and therefore a clear statement of the nature of the industrial training is important. In these circumstances it is considered that the best approach is to give the students training in four basic types of industrial activity; thus the first period is usually spent in an analytical or central laboratory, the second in a research laboratory, the third in a development or semi-technical scale laboratory, and the last on plant or production.

Chemical Institute of Canada.—During the 43rd Conference of the Chemical Institute of Canada in Ottawa on 13-15 June the C.I.C. Medal was presented to Dr Clifford B. Purves, Professor of Industrial and Cellulose Chemistry at McGill University. Dr Purves is well-known for his research on lignin.

Isotope Information Bureau.—On 16 June, Sir Roger Makins, G.C.B., G.C.M.G., Chairman of the U.K. Atomic Energy Authority, opened the Isotope Information Bureau at the London Office of the U.K.A.E.A. in Charles II Street. Senior scientific staff from the Authority answered press inquiries, and there was an exhibition describing isotope applications. The purpose of the Bureau is to provide a centre in London where information about isotopes and their applications to industrial processes can be given, with a view to expanding their use in industry.

New Acetic Acid Plant.—The Distillers Company Ltd have announced that their Chemical Division is to construct a new acetic acid plant at its chemical factory at Hull, at a cost of some £2 million. It will be the first of its kind in Europe, and will use a new process developed by the D.C.L. Research and Development Department at Epsom, and based on the direct oxidation of a light petroleum fraction. The plant is expected to be in operation early in 1962, when a proportion of the Company's output of acetic acid will be made by this new process.

New Synthetic Methanol Plant.—British Hydrocarbon Chemicals Ltd is having a synthetic methanol plant erected at Grangemouth by Chemical Construction (G.B.) Ltd. Hydrocarbon gases from existing ethylene plants will be used as feedstock. The gases will be reformed to carbon dioxide, carbon monoxide and hydrogen in ratios suitable for the high pressure synthesis of methanol. The crude methanol will be refined by extractive distillation to yield a product of high purity for use in the manufacture of resins, antifreeze and various esters and solvents.

Change of Address.—The Editorial Office of the Chemical Society has moved to 38 York Terrace, Regents Park, London, N.W.1. Tele: WELbeck 1707.

Obituary

John Reginald Blockey. *B.* 19.2.1887. *Ed.* University of Leeds, 1905–09. M.Sc. He was appointed lecturer and demonstrator at the Leathersellers' Technical College, London, in 1909. He left in 1913 to become a research chemist, Wm Paul Ltd, Leeds, and was thereafter successively research chemist, Wm Walker & Sons Ltd, Bolton, 1917; works manager, Driped Ltd, Bolton, 1920; works manager, Harold Nichols Ltd, Leeds, 1930. He returned to the Leathersellers' Technical College as Principal in 1936, where he remained until his retirement in 1954. During the Second World War he was also technical director, Ministry of Supply Leather Control. (*F.* 1944.) *D.* 27.2.60.

Romily David Thomas Ernest Chandler. *B.* 16.6.13. *Ed.* University College, Southampton, 1930–33; Municipal College, Portsmouth, 1935–36; Chelsea Polytechnic, 1943–44. He became chief assistant chemist to Herbert Ferryman Ltd, Southampton, in 1942, and at the end of that year took a similar post with Optrex Ltd, Greenford. In 1945 he was appointed chief chemist to Pond's Extract Co. Ltd, Perivale. He left this country in 1947 to take up a post as chief chemist to Parry, Murray & Co., of Madras, but returned early owing to unforeseen circumstances and joined the Ministry of Supply at Porton as an experimental officer. A little later he took a retail pharmacy until 1951, when he joined the Ministry of Health. The following year he took a post as a chemist to the Government of Malaya, where he remained until 1955, when for a short time he occupied a post with A. S. Watson & Co. Ltd, Hong Kong. On returning to this country in 1956, he was appointed lecturer in physics and chemistry at Southampton Technical College, a post which he held until the time of his death. (*A.* 1947.) *D.* 15.1.60.

Jack Firth. *B.* 3.2.1897. *Ed.* Leeds Central Technical School, 1919–22. He entered the laboratory of B. A. Burrell, proprietor of the consulting practice of T. Fairley and Partner, Leeds, as senior assistant in 1922. On Mr Burrell's death in 1927, Firth took over the practice and remained in control for the rest of his life. (*A.* 1925, *F.* 1943.) *D.* 22.8.59.

William Edward Garner. *B.* 12.5.1889. *Ed.* Bosworth Grammar School; University of Birmingham, 1908–13; University of Göttingen, 1913–14. M.Sc. (Lond.), D.Sc. (Birm.). His first appointment was as a chemist in the Research Department, Woolwich. He took a post as a lecturer in the University of Birmingham in 1918, and the following year accepted a similar post at University College, London, becoming reader in physical chemistry in 1925. He was appointed Leverhulme Professor of Physical Chemistry at the University

of Bristol in 1927, a post which he retained until his retirement in 1954. He was admitted to F.R.S. in 1937, and appointed Pro-Vice-Chancellor of the University in 1952. During the Second World War, he served the Ministry of Supply, firstly as Superintendent, Chemical Research, later as Chief Superintendent, Armaments Research, and was awarded the C.B.E. in 1946. Professor Garner was best known for his contributions to the study of flames and explosions, though his interest in research covered a wide field. (*A.* 1919, *F.* 1946.) *D.* 4.3.60.

Charles Gordon Gates. *B.* 1885. *Ed.* King's College, London, 1901–04. He became in 1905 an assistant to E. Russell, public analyst to the Borough of Portsmouth. When Russell was appointed the following year public analyst and bacteriologist to the City and County of Bristol, Gates accompanied him. Later he became an H.M. Inspector of Factories. (*A.* 1906, *F.* 1909.) *D.* 13.12.59.

James Ramsay Hannay. *B.* 9.8.1873. *Ed.* Melville Street Public School, Pollokshields; Glasgow and West of Scotland Technical College. He became a pupil apprentice to Dr John Clark, Public Analyst for the City of Glasgow, in 1888. He was appointed assistant chemist in the laboratory of the Cassel Gold Co. in 1892, and thereafter became successively principal chemist, R. Dalglish Falconer & Co. Ltd, Lennoxtown, 1893; chief assistant to the chief chemist, Calico Printers' Association Ltd, Manchester, 1906; chief chemist and assistant manager, John Glen & Sons, Caldercruix, 1911; works manager, Know Mill Printing Co. Ltd, Entwistle, 1912; works manager, J. F. & E. Caulfield Ltd, Newton-le-Willows, 1926. He became a part-time lecturer at Manchester College of Technology in 1934 and three years later joined Liberty & Co. Ltd, London, as assistant to the general manager. He remained there until his retirement in 1941. He was actively interested in the work of the Society of Dyers and Colourists and served on a number of its Committees. The Gold Research Medal of the Worshipful Company of Dyers was awarded to him in 1915–16. (*F.* 1919.) *D.* 5.3.60.

William Moore. *B.* 20.7.1870. *Ed.* Barton School, Wisbech; King's College and University College, London. After serving an apprenticeship to a Rochester pharmacist, he entered the School of Pharmacy, London, where, in 1892, he obtained a first certificate of honour in practical chemistry and materia medica. He left the following year to become assistant firstly to Mr W. Martindale and later to Mr A. J. Phillips. He returned to the School of Pharmacy as a demonstrator in 1894, and after one year was appointed Professor Attfield's private assistant. In 1897 he accepted a post as chemist to the Planter's Stores and Agency Co. Ltd, of Dibrugarh, Upper Assam, India, a position which he held until his retirement in 1926. Whilst in India, his main relaxations were botany, fishing and shooting, and on his retirement his chief interest was horticulture, though he enjoyed any form of natural history. Mr Moore left substantial legacies to the Institute and to the Benevolent Fund. (*A.* 1897, *F.* 1902.) *D.* 19.11.59.

Bernard O'Shaughnessy. *B.* 29.8.1876. *Ed.* Royal College of Science, London, 1900–03. He continued at the College for a further year as a demonstrator, and in 1904 joined the Standard Ammonia Co. as chemist and assistant manager. For a few months during 1906 he was chief chemist at the Steel Works, Brymbo, Wrexham, and in June of that year he took up an appointment as principal and organizing secretary at the Central Technical Institute, Waterford. He returned to England in 1921 to become assistant in charge of the Junior Day Technical Department of the London School of Photo-Engraving and Lithography. He remained at the school until his retirement in 1937, when he was lecturer in chemistry. He continued for over ten years in part-time teaching for the London County Council. (*A.* 1905, *F.* 1909.) *D.* 27.1.60.

Marshall Jeffreys Robb. *B.* 3.4.1888. *Ed.* University of Aberdeen, 1906–11. B.Sc. He became in 1912 the chief assistant of the late Dr J. F. Tocher, public analyst, with whom he remained associated for over thirty years. He succeeded Dr Tocher in 1946, but retired the following year on account of ill-health. He was known far beyond Scotland, as he was the author of a book on whisky, published in the U.S., and of several articles on the same subject. His hobbies were photography, mountaineering and fishing. (*A.* 1912, *F.* 1915.) *D.* 16.2.60.

Theodor Schwarz. *B.* 20.5.1885. *Ed.* Untergymnasium, Arnau and Smichow, Czechoslovakia, 1896–7, 1899–1900; Staatsgewerbeschule, Reichenberg, Czechoslovakia, 1900–04. Schwarz, who was a Czech by birth and became a Mexican citizen in 1934, was the last non-British member of the Institute. He came to this country in 1907 and took a post as a chemist, firstly with Kynochs Ltd and later with Curtis & Harvey Ltd. Three years later he joined A. G. Dynamit Nobel at Pressburg, and in 1912 he went to Mexico to take an appointment with the Mexican Dynamite & Explosives Co. at Durango, of which he later became technical manager and subsequently director. He was for many years Vice-Consul in Mexico for the Republic of Czechoslovakia and had a very successful career. He moved to Macon in Georgia, U.S.A., in 1952, where he lived until his death. (*A.* 1910, *F.* 1919.) *D.* 19.2.60.

George Taylor. *B.* 28.2.1881. *Ed.* Finsbury Technical College, 1896–1899; King's College, London,

1899–1900. He commenced his career as an assistant to Mr T. A. Pooley, Public Analyst for Essex, in 1901. On Mr Pooley's death in 1906, Taylor was appointed an assistant to Dr Bernard Dyer, and when the practice was converted into a partnership in 1926, Taylor became one of the partners. He remained with the practice for the rest of his life, becoming an Official Agricultural Analyst on Dr Dyer's death in 1948. Committee work was one of his greatest interests and he served on very many widely differing committees. He was Honorary Treasurer of the Society for Analytical Chemistry, 1940–48, and President of that Society, 1948–50. He was also the first president of the Association of Public Analysts and an original member of the Food Standards Committee of the Ministry of Agriculture, Fisheries and Food. He was appointed O.B.E. in 1949 for his work on this Committee. He was a member of the Advisory Committee of the Ministry of Agriculture and, in recent years, Chairman of its Scientific Sub-Committee, as well as the representative of the Society for Analytical Chemistry on the Parliamentary and Scientific Committee. An enthusiastic hockey player, he continued playing until the age of 50. He was also an ardent bridge player. (*F.* 1917; Examiner, 1947–51; Council 1951–54; Vice-President 1954–56; Censor 1957–59.) *D.* 28.2.60.

Eric Thornton. *B.* 4.12.16. *Ed.* Huddersfield College; University of Leeds, 1935–38. B.Sc. He joined the Yorkshire Dyeware & Chemical Co. Ltd as an assistant chemist in 1938, was promoted to production chemist in 1940, and to departmental production manager in 1946. He remained with the company for the rest of his life. He was also a part-time lecturer at Leeds College of Technology from 1943. (*A.* 1953.) *D.* 4.3.60.

CORRESPONDENCE

British Visitors to the U.S.S.R.

Sir,—Your readers may remember that in the February 1960 issue of the *LLU Translations Bulletin* we announced that the L.L.U. is collecting reports on visits made by British technical specialists to the U.S.S.R. The intention is that these reports will be made generally available on loan in the same way as any other literature that we hold, but if required, references to the original of the report will be suppressed.

In themselves these reports contain much information which is of interest to U.K. scientists and engineers, and the reports usefully supplement our growing collection of original and translated Russian scientific literature. In addition, they are of considerable assistance to the staff of this Unit in answering the growing number of technical inquiries on current Russian practice. The reports also are very useful to people planning to visit industrial and research establishments in the U.S.S.R.

For some time now we have been encouraging 'potential visitors' to consult this Unit well in advance of their visits so that we can advise them about the literature they ought to read, and also, perhaps, about the more interesting research establishments and factories they might be able to visit.

While we are already able to give appreciable help to 'potential visitors', it is clear that the availability of a comprehensive collection of 'reports on previous visits' would enable us to give a much better service. Accordingly, therefore, I am writing to ask if you would be good enough to inform your members of these new L.L.U. activities and recommend them to deposit copies of any relevant reports they might write with the L.L.U.

H. Schur,
Lending Library Unit,
D.S.I.R.

20 Chester Terrace,
Regents Park,
London, N.W.1.

H.N.C. Practical Examinations

Sir,—The difficulty of setting fair practical examinations for Ordinary and Higher National Certificates in Chemistry is generally recognized by teachers in technical colleges. I would like to suggest the need for a complete re-consideration of the methods of assessing practical ability in organic chemistry in these courses. Some of my remarks apply to practical inorganic chemistry as well, and I hope that teachers in this branch of the subject will contribute their views.

At this College, organic chemistry is introduced only in the final (S3) year of the O.N.C. course. This is done so as to make room for more physics and mathematics in the course, and is an arrangement with which I am in full agreement. It is also one which will certainly become more widespread. In the final year of the H.N.C. course, therefore, the student is only in his third (part-time) year of practical organic chemistry. In these three years there is time to introduce the student to the fundamentals of sound practical technique, and to allow him to practice this technique in the identification of unknown single compounds, but his ability to tackle genuine problems is bound to be limited. The final examination can attempt to test either his manipulative skill, as in a preparation, or his ability to solve a problem, *i.e.* identify an unknown. (The techniques of quantitative analysis at this stage would be the same as those of inorganic chemistry.) With relatively inexperienced students, an examination which requires the identification of an unknown often has unfortunate results. I have known students whose work was slipshod throughout the year pass this kind of test easily, and one or two unfortunate cases where a student whose work was normally of a high standard failed. As a result the A2 practical examination is often made as innocuous

as possible. As for the assessment of manipulative skill, the teacher who has observed a student's laboratory work for a year has already formed his opinion of this. Effective external assessment of this type of examination is impossible, and the result must therefore lie entirely in the hands of the teacher, whose opinion is already formed before the examination.

Under the present system a student requires a mark of at least 40 per cent in both the practical examination and in his practical class-work through the year (these figures are included in a weighted mean which must be over 50 per cent for a pass). This means in practice that the student can slack throughout the year in the laboratory and do badly in the examination, yet still have enough marks to pass. I would ask for the abolition of the organic practical examinations, and the institution of a pass mark of at least 65 per cent on the year's practical class-work. The effect of these two steps would be to increase greatly the attention paid by a student to his practical work. A detailed syllabus of the experiments to be performed during the year would, of course, be agreed between the college and the Institute. I think, too, that it would be a good thing if an official of the Institute were to visit each college once during the year so that an actual check could be made on the standard of practical work, and so that high standards could be encouraged.

I have written about the examination for the H.N.C.; the same considerations obviously apply to the O.N.C. examination where a student has only one year of organic practical behind him. I am sure that the need to set a higher standard for practical class-work applies equally to inorganic chemistry. Perhaps it is time for a review of the whole system of assessing practical work in National Certificate Courses.

B. H. WALTER,
Lecturer in Charge of Organic Chemistry

Chemistry Department,
Whitehaven College of
Further Education.

THE REGISTER

NEW FELLOWS

(Q) BIRCH, Prof. Arthur John, M.SC. (SYD.), D.PHIL. (OXON.), F.A.A., F.R.S.
(H) BREALEY, Leslie, B.SC. (LOND.)
(P) CRAIG, Prof. David Parker, M.SC. (SYD.), PH.D., D.SC. (LOND.)
(P) CROSS, Brian Edward, B.SC., PH.D. (LOND.), M.A. (DUBL.)
(D) EVERETT, Prof. Douglas Hugh, M.B.E., M.A., D.PHIL. (OXON.), D.SC. (R'DG)
(P) TOMPKINS, Prof. Frederick Clifford, PH.D., D.SC. (LOND.), F.R.S.
(P) WILKINSON, Prof. Geoffrey, B.SC., PH.D. (LOND.), A.R.C.S., D.I.C.

ASSOCIATES ELECTED TO THE FELLOWSHIP

(N) COATES, Eric, M.A., B.SC. (OXON.)
(N) DEAN, Raymond Ernest, B.SC., PH.D. (LOND.)
DIAPER, Prof. Dennis George Mayhew, M.A., B.SC., D.PHIL. (OXON.), M.C.I.C.
(Q) HULME, Alan Frederick, A.R.T.C.S.
(P) JULIAN, Kenneth Arthur Reeves, B.SC. (LOND.), M.I.CHEM.E
(P) PRAILL, Percy Francis George, B.SC., PH.D. (LOND.)

NEW ASSOCIATES

(X) AMES, Thomas Rawlinson, B.SC., PH.D. (MANC.)
(OB) BROOKS, Robert Richard, B.SC. (BRIST.)
(OA) FALLOWS, John Charles Joseph, B.SC. (NOTT.)
(P) HALEWOOD, Paul, B.SC., PH.D. (LIV.)
(P) HOLT, Neville Antony Hedger, B.A. (CANTAB.)
(OA) HSIA, Richard Chung-Hu, B.SC. (PEKING), PH.D. (LOND.), D.I.C.
(P) JULIETTI, Frederick John, B.SC., PH.D. (LOND.)
(P) PEARCE, Christopher Arthur, B.SC., PH.D. (LOND.)
(D) PRIDDLE, John Edward, B.SC. (BRIST.)
(Q) PRIOR, Alan Francis, B.SC., PH.D. (CANTAB.)
(P) RITCHIE, Alexander Crawford, B.SC., PH.D. (GLAS.)
(C) SMITH, Mary Joyce, M.SC. (BIRM.)
SORGO, Poznan Mirosevic, M.A., PH.D. (CANTAB.)
(Y) THEOBALD, David William, M.A., B.SC. (OXON.), DIP.ED.
(C) THOMAS, John Thurston, B.SC. (WALES), PH.D. (LEEDS), DIP.ED.
(OB) THORNTON, Geoffrey Parke Kidson, B.SC. (S.A.), M.S.A.CHEM.I.
(OF) WARRIOR, Shivdas Krishna, B.SC., B.SC. TECH. (BOM.)

GRADUATE MEMBERS ELECTED TO THE ASSOCIATESHIP

(D) COLEMAN, Arthur Kenneth
(P) CURRELL, Brian Robert, B.SC., PH.D. (LOND.)
(S) EDWARD, Harold Stanway, A.P.I.
(Y) GARDINER, John
(B) KIRKPATRICK, Robert Vincent, B.SC. (BELF.)
(O) LEFLEMING, Richard Charles
(C) MAYLOR, John Bernard
(SS) METCALFE, Jack
(P) MORRIS, Ivor Alan, B.SC., PH.D. (LOND.)
(SS) NORCROSS, Kenneth
(Q) ROBINSON, Gerald
(Q) ROBINSON, Peter Vernon
(O) SALTER, Kenneth
(Q) SHAW, Geoffrey, A.R.T.C.S.
(P) WALKER, Aubrey Douglas

NEW GRADUATE MEMBERS

(K) COLQUHOUN, Donald Edward, B.SC. (GLAS.)
(B) MARTIN, William John, B.SC. (BELF.)
(P) RICHMOND, Joan Wendy, B.SC. (BIRM.)
(D) RICKWOOD, Peter Cyril, B.SC. (LOND.)

CHANGES OF NAME ON MARRIAGE

Elizabeth Barbara CHEEK to MERRY, *Associate*
Louise Elizabeth GREIG to RUSSELL, *Associate*
Cora Rosemary MANCHESTER to BURCH, *Graduate Member*

DEATHS

Fellows

BOYD, James. Died May, 1960, aged 74. *A.* 1908, *F.* 1911.
(R) CARLOS, Arthur Sidney, B.SC. (LOND.). Died 17 June, 1960, aged 72. *A.* 1915, *F.* 1918.
McCRAE, John, PH.D. (HEIDELBERG). Died 12 April, 1960, aged 84. *F.* 1906.
(P) OLIVER, James Herbert, PH.D. (LOND.). Died 1 June, 1960, aged 58. *A.* 1923, *F.* 1945.
(T) WILDE, Bertrand Ernest, B.SC. (LOND.). Died 23 May, 1960, aged 42. *A.* 1941, *F.* 1946.

Associates

(H) BUCHANAN, Peter Ritchie, B.SC. (GLAS.). Died 31 May, 1960, aged 59. *A.* 1925.
STROM, Eric Greve, D.F.C., B.A., B.SC. (MELB.). Died 2 February, 1960, aged 38. *A.* 1946.